American Artisan

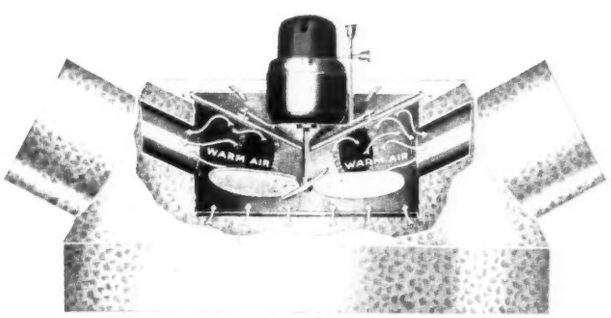
Founded 1880

The Warm Air Heating and Sheet Metal Journal

Vol. 98, No. 1 CHICAGO, JULY 6, 1929 $2.00 Per Year

ROBINSON
Heat Distributor

The ONLY Furnace Fan that forces the warm air direct to the rooms



The ONLY Furnace Fan that sends extra heat to the rooms needing it

. . . . performs a distinctly exclusive warm air heating service

BECAUSE it renders an efficient service at a low cost it is the favorite and largest selling furnace fan on the market.

Because it brings a good profit—is easily sold and easily and quickly installed, dealers everywhere are featuring it.

Your prospects will show a *greater interest* in warm air heating when you show them the *ROBINSON Heat Distributor.*

They will see *at once* how it increases the efficiency of the warm air heating system.

The *ROBINSON Heat Distributor* is quiet, smooth running, powerful and trouble proof.

It does not interfere with gravity operation and it can be installed to operate with thermostatic control.

Learn more about it *now*—write to any of the firms listed below for full details.

Manufactured by

The A. H. ROBINSON CO., MASSILLON, OHIO

Write to any of these progressive firms for full details and prices

BAKER-PAYNE-VOYE CO. . . Boston, Mass.
THE BECKWITH CO. . . . . Dowagiac, Mich.
CARR SUPPLY CO. . . . . Chicago, Ill.
DAYTON-HESSLER CO. . . . . Syracuse, N. Y.
DEMMLER BROS. CO. . . . . Pittsburgh, Pa.
FARRIS FURNACE CO. . . . . Springfield, Ill.
C. L. FEATHERSTONE FURNACE CO. . . . . Spokane, Wash.
FOLLANSBEE BROTHERS CO., Pittsburgh, Rochester, Cincinnati, Memphis, Detroit, Indianapolis, Milwaukee, Louisville.
FLORAL CITY HEATER CO., Monroe, Mich.
FOX FURNACE CO. . . . . Elyria, Ohio
HEATING & SUPPLY CO., Pittsburgh, Pa.
HENRY FURNACE & FOUNDRY CO., Cleveland, O.; Indianapolis, Ind.; Pittsburgh, Pa.
M. K. HOKE . . . . . Manheim, Pa.
HOMER FURNACE CO. . Coldwater, Mich.
IDEAL FURNACE CO. . . . . Detroit, Mich.
KELLEY-HOW-THOMSON CO., ... Duluth, Minn.
W. E. LAMNECK CO. . . . . Columbus, Ohio
LENNOX FURNACE CO., Inc., Syracuse, N.Y.
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THE MAJESTIC CO. . . . . Huntington, Ind.
MAY-FIEBEGER CO., Newark, O.; Akron, O.
MIDLAND FURNACE CO., Columbus, Ohio
MONCRIEF FURNACE CO. . . . Atlanta, Ga.
NEW IDEA FURNACES, LTD., ... Ingersoll, Ont., Can.
THE OHIO SHEET METAL & MFG. CO., ... Dayton, Ohio
J. M. & L. A. OSBORN CO., ... Cleveland, O.; Buffalo, N. Y.
PEASE FOUNDRY CO., Ltd., ... Toronto, Ontario, Canada
PENINSULAR STOVE CO. . Detroit, Mich.
PORTLAND STOVE FOUNDRY CO. . . . . Portland, Maine
RICHARDSON & BOYNTON CO., New York, Chicago, Boston, Philadelphia, Buffalo, Minneapolis, Newark, N. J.
THE SCHILL BROS. CO. . . . Crestline, O.
WESTERN STEEL PRODUCTS CO. . . . . Duluth, Minn.
GEO. F. WHEELOCK CO., Birmingham, Ala.
WISE FURNACE CO. . . . . Akron, Ohio

TS 200
.A7

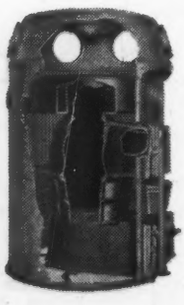
No. 1 of a series of advertisements on the ease and simplicity of NIAGARA Furnace assembly and installation.

Easy Leveling With NIAGARA One Piece Base

This is the one-piece Niagara base. Note the full cup joints for ashpit and casing.

THE best place to start anything is at the beginning. That's why, in building the new NIAGARA right, we began at the base. Here's a base that's on the level in more ways than one. Made entirely in one piece, it's a simple matter to level it—no time is lost trying to make two or three pieces all into a perfectly level whole. With the base level and in place in almost no time, the ash pit slips into the full cup joint provided for it like a well lubricated piston fitting into a cylinder. And another thing, the bottom of the ash pit is recessed to permit of wetting down the ashes.

Watch for the next Niagara ad—more about Niagara ease of installation.



Sectional view of Niagara Furnace encased.

THE FOREST CITY-WALWORTH RUN FOUNDRIES CO.
Member National Warm Air Heating Association
2500 West 27th Street — Cleveland, O.

NIAGARA

WARM AIR HEATING SYSTEMS

Low Water Rates *from*

Help Sell
The WESTERN Furnace
Everywhere!

The Western Steel Furnace is sold conveniently in any part of the country. Its distribution is economical due to its advantageous factory location in Duluth, Minnesota—at the head of navigation on the Great Lakes—right where the iron is mined—combined with the complete coverage of the distributing points listed below.

The Western is strongly built, profitable to sell and practical to use. Write for catalog No. 16 which gives complete information.

Western Steel Products Company

130 Commonwealth Avenue - - - Duluth, Minnesota

Distributed by

Atlanta, Georgia.....Moncrief Furnace Company
Chicago, Illinois....Western Steel & Products Co.
3025 West Van Buren
Cincinnati, Ohio....Niehaus Furnace Repair Co.
Fargo, N. Dakota, Fargo Cornice and Ornament Co.
Fort Dodge, Iowa.....Leighton Supply Company
Kansas City, Kansas....Kansas City Furnace Co.
Pittsburgh, Pa...Wagener-Proie Furnace Company
Ravenna, Ohio .....Ravenna Furnace Company
St. Louis, Mo. .....Mac-Roy Supply Company
115 So. 14th St.
San Francisco, Cal. .....
.....Pacific Sheet Metal & Furnace Co.
Seattle, Washington .....
.....McPherson Furnace and Equipment Co.

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AFCO - GRAMS
BRIEF AND TO THE POINT

Mr. Furnace Installer,
Anywhere, U. S. A.

Furnaces that require a lot of servicing and adjustments wipe out the profit. "AFCO" dealers avoid this expense by installing "AFCO Boiler Plate Furnaces. They are built right and give the buyer complete heating satisfaction.

If you are interested in the future as well as the present you should know about "AFCO" furnaces and how they will help you make a fair profit on each installation. Why delay?

AMERICAN FURNACE CO.
ST. LOUIS, MO.

Reply suggested here:_____

_____

CALORIC

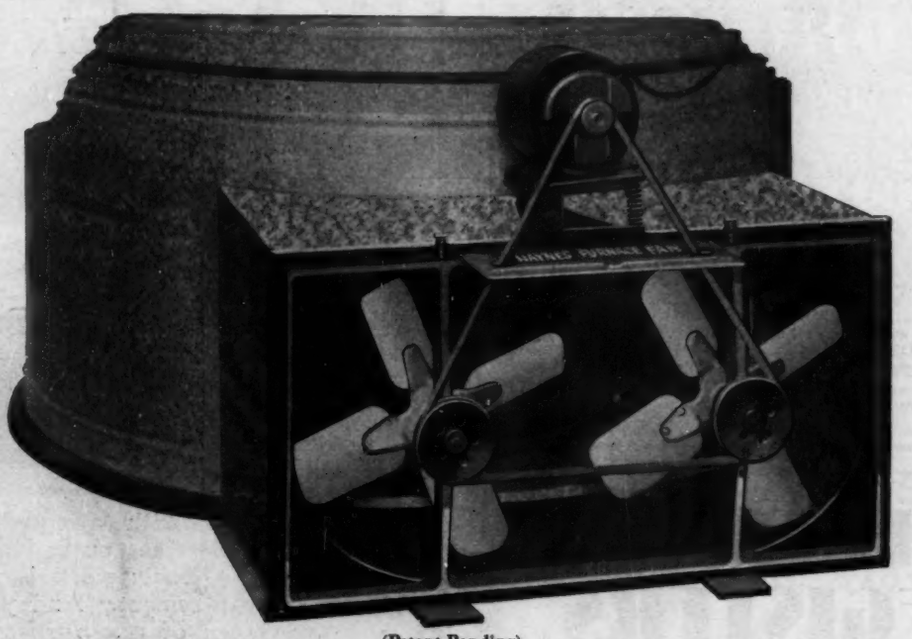
THE RADIATOR

A MASTERPIECE of the molder's art, made of uniform thickness, smooth inside and has smoke and cleanout collars cast on in a single seamless casting. The radiator is made large with ample smoke and gas space and with smoke and cleanout collars expanded where they joint on to the radiator for easy cleaning purposes and to increase radiating surface.

Repairs for all old model Monitor products

MONITOR-CALORIC DIVISION
MARSHALL FURNACE CO.
MARSHALL, MICHIGAN

The Noiseless Fan!



Simple Low Priced

◇

Send for Circular Today

—

(Patent Pending)

The Haynes Furnace Fan!

A slow speed noiseless fan belt driven to eliminate motor noises. Special mounting on rubber. Under actual tests The Haynes Fan will build up more pressure than any other fan.

Kansas City Furnace Co., 328 W. 6th St., Kansas City, Mo.

A-C *Thermostatically Controlled* FURNACE FAN

—a simple, inexpensive furnace fan that will

REALLY S-E-L-L

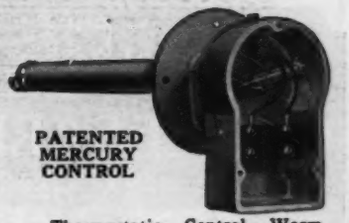
AUTOMATIC

because it is THERMOSTATICALLY controlled and requires practically no attention after installation, works AUTOMATICALLY,—it is QUIET and EFFICIENT,—it is EASILY INSTALLED in any type of installation and DOES NOT INTERFERE WITH GRAVITY OPERATION,—PERFORMS BETTER than any other fan made and SELLS FOR LESS than any other similar fan on the market.

COMPLETE TO THE DEALER AT—

Mercury Control, Heat Booster, Fan and Unit with Emerson Motor—all ready to install, our No. 9 Size with 10-inch Outlets designed for the average small home—complete for .....

$37.50



PATENTED MERCURY CONTROL

Thermostatic Control Warm Air Furnace Fan Licensed under Re. Pat. No. 15531.

Larger size outfits for larger homes and Churches, Schools, Halls, etc., at proportionately low prices.

A-C Manufacturing Co.

417 Sherman St.---Pontiac, Ill.

ORDER FROM YOUR JOBBER

Get in on this profitable fan business NOW —be ready for Fall business. Ask your Jobber or send Coupon direct to us— TODAY!

A-C MFG. CO., PONTIAC, ILL.
Send me complete details.

Name .....

Street..... *Town*..... *State*.....

JOBBER'S NAME .....

LIQUID ASBESTOS In WHITE or COLORS

BRAND new numbers in attractive fadeless colors in furnace covering, coating, and insulation. JUST WHAT YOU NEED to increase your sales. Each attractive installation sells another. Spreads with a brush. Easy to apply—no cutting and fitting—no paste. TAKES THE PLACE OF ASBESTOS PAPER on old or new furnaces. Apply over tin, galvanized iron, or paper covered surfaces.

MAKE THE INSTALLATION 100% SEAMLESS with LIQUID ASBESTOS, the tailor-made suit for every furnace.

OFFERS NEW SALES TALK

HELPS INCREASE SALES. A trial order is convincing. There are many reasons why every furnace dealer should know about LIQUID ASBESTOS. It's far superior to any other covering.

FIRE AND WATERPROOF

Dealers who are using LIQUID ASBESTOS are getting surprising results. *Ask for our SPECIAL DEALERS' PRICES TODAY.*

B. & F. MFG. CO., Dept. 7, Des Moines, Iowa

INDEPENDENT REGISTERS

VENTILATORS - GRILLES

"Fabrikated" Cold Air Faces

ANY SIZE - ANY FINISH

Ask for a copy of our New Catalogue

Independent Register & Mfg. Co.

3747 E. 93rd St. CLEVELAND, O.

BACKED BY EXPERIENCE

Established 1902 — *Famous For Service*

CHICAGO FURNACE PIPE AND FITTINGS

A Better Installation Is possible now with this new Self-Locking Double Stack

CHICAGO Pipe has been the choice of thousands of furnace men for over 26 years—now this improved pipe represents *extra* value—the result of experience and modern manufacturing methods. It clicks together quickly and easily—stays together and makes a stack of unequaled strength.

Ask about it now—write for our Catalog No. 21—on Chicago Pipe and all Furnace Supplies

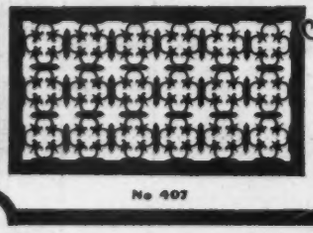
CHICAGO FURNACE SUPPLY CO.

1276-78-80-82 Clybourn Ave. CHICAGO

Ornamental HIGHTON Ventilating

GRILLES & REGISTERS

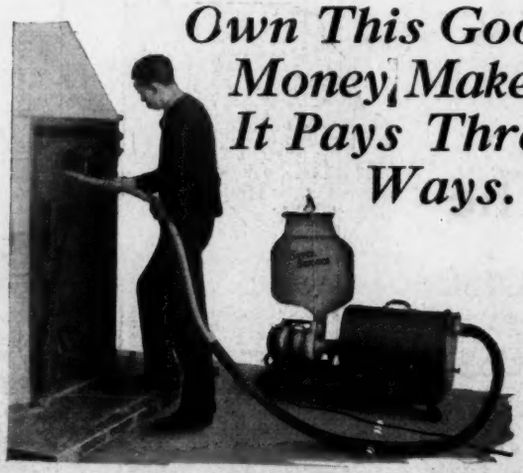
COMPLETE LINE IN CAST AND WROUGHT METALS



For all grille and register requirements write
Wm. Highton & Sons
Div. Hart & Cooley Mfg. Co.
Nashua, N. H

No 407 No 578 No 575 No 520

Own This Good Money Maker. It Pays Three Ways.



3 to 4 jobs a day—one man—powerful—light.

CLEANING with a speedy, one-man Super Service outfit brings good money. Repair work is waiting for you in every basement. And you get first hand knowledge of new furnace prospects.

Our *Plan Book* tells how to go after bigger profits—shows sales methods that are winners everywhere.

One Super Service owner kept 30 repairmen busy all last summer. Write today for Plan Book and terms.

The National Super Service Co.

816 Lafayette St. Toledo, Ohio

BOLTS

WE MANUFACTURE A COMPLETE LINE OF BOLT PRODUCTS, INCLUDING STOVE BOLTS, CARRIAGE BOLTS, MACHINE BOLTS, LAG BOLTS, NUTS, COTTER PINS, ETC. ALSO STOVE RODS, SMALL RIVETS AND HINGE PINS. CATALOG ON REQUEST.

THE LAMSON & SESSIONS CO.

THE KIRK-LATTY CO.

1971 W. 85th St. Cleveland, O.

PATTERNS FOR STOVES AND HEATERS

THE CLEVELAND CASTINGS PATTERN COMPANY

CLEVELAND, OHIO

IRON AND WOOD

STOVE PATTERNS

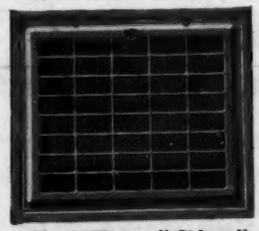
QUINCY PATTERN COMPANY

QUINCY, ILLINOIS

PATTERNS

FOR STOVES AND HEATERS FIRST-CLASS IN WOOD and IRON

VEDDER PATTERN WORKS ESTABLISHED 1885 **TROY, N. Y.**



The *"Flapper" Sidewall Register Style 302

*Copyright Applied For

TUTTLE & BAILEY

SUPER-REGS

Reg. U. S. Pat. Office

COMPRISE
EVERY TYPE REGISTER
AND FACE FOR
WARM AIR HEATING

Stocks carried in all principal cities

TUTTLE & BAILEY MFG CO.

Established 1846

441 Lexington Avenue New York

Look for the "Cobble" Floor Register
in the July 20 issue

The AUERISTOCRAT

of all registers, combining air capacity, decorative and concealing features.

Designed to conform with the Standard Code so they fit all standard boxes.

Auer Patented mechanical features make it perfect in operation,—quick and easy to install.

Auer's Save Hours and Dollars

The AUER REGISTER CO.
Cleveland, Ohio

Cut down the Overhead

To make money, you have to do two things. Sell more furnaces. Keep down the overhead.

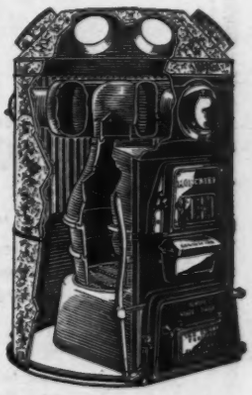
Moncrief Furnaces are designed and built so as to make both easy,—finished in Autumn Red, joints ground and fitted to go together without further fitting on the job.

Send for particulars

■

The Henry Furnace & Foundry Co.
3471 E. 49th St.
CLEVELAND, OHIO

■



Distributors:

Carr Supply Co., 412 No. Dearborn St., Chicago, Ill.
August Bery & Son, Mack Ave. at Drexel, Detroit
The Henry Furnace & Foundry Co., Pittsburgh, Pa.
Frontier Water & Steam Supply Co., 366 Oak St. —481 Elliott St., Buffalo, New York
Johnson Furnace Co., Kansas City, Mo.
E. A. Higgins Co., 1112 Douglas St., Omaha, Neb.
Moncrief Furnace & Mfg. Co., Dallas, Texas
E. W. Burbank Seed Co., 29 Free St., Portland, Me.
J. F. Conant, Ry. Term. Warehouse, Troy, N. Y.
Wilkes-Barre Hdwe. & Stove Co., 18-20 So. Washington St., Wilkes-Barre, Pa.
The Crawford Heating Co., Steubenville, Ohio.
Stockhoff Supply Co., St. Louis, Mo.

EASTERN OFFICE
Room 1306, 11 W. 42nd St., New York City
E. L. Garner, Manager

MONCRIEF FURNACES

We supply everything used on a warm air heating job.

Founded 1880

Entered as second class matter, March 26, 1928, at the Post Office at Chicago, Ill., under act of March 3, 1879. Formerly entered on June 25, 1887, as American Artisan and Hardware Record.

American Artisan

The Warm Air Heating and Sheet Metal Journal

Yearly Subscription Price:

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Foreign $4.00

Published EVERY SATURDAY—to Promote Better Warm Air Heating and Sheet Metal Work

PORTER - SPOFFORD - LANGTRY CORPORATION
139 North Clark Street, Chicago—Telephone Central 7670

Fred D. Porter, *President* John C. Langtry, *Vice-President* Howard H. Bede, *Secretary*
Editor: G. J. Duerr *Business Manager*: Etta Cohn

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F. R. Whitten, *Eastern Representative*

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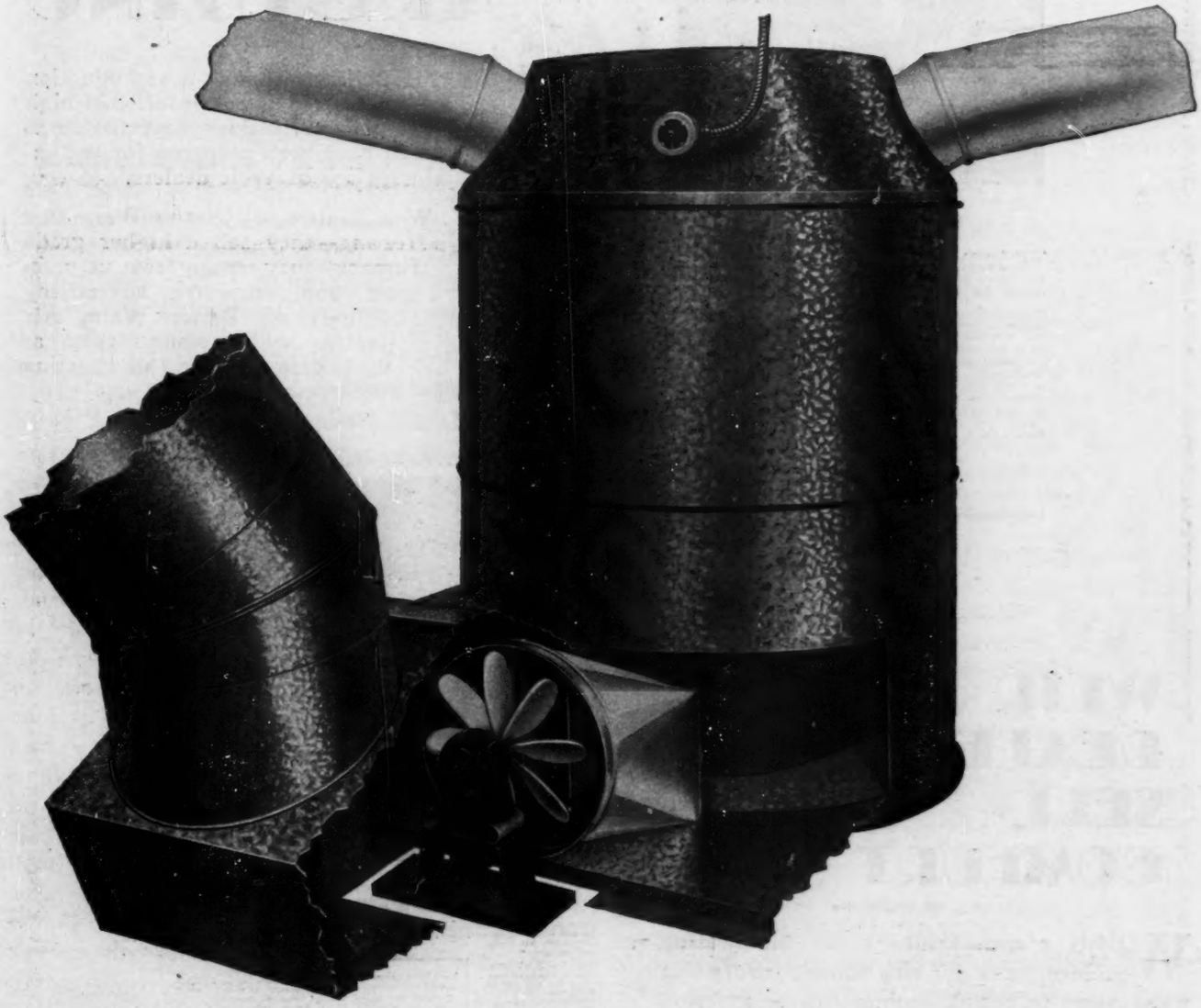
SPEE-DEE-HEET

THE newly improved SPEE-DEE-HEET Blower is offered in three complete series, and in sizes from 12" to 36" diameter blade. The De Luxe Series for residence installations are three-speed—two speeds for heating, thermostatically-controlled—and the high speed for Summer circulation.

A WONDERFUL new improvement is the SPEE-DEE-HEET Comfort Control. It gives a complete control of air motion within the building. It is inexpensive, attractive in appearance, and easily installed. It is a big forward step in providing a much-needed convenience.



The SPEE-DEE-HEET Distributor catches the driven stream of air from the Blower and delivers it downwardly and outwardly inside the casing, away from the ashpit. Air against air—not against the castings. No noisy and troublesome dampers or louvres needed—and the air-duct is always open. Quiet operation and certain results.

FIND OUT ABOUT THE
SPEE-DEE-HEET DemonstrAIR!

A SMALL nickel-plated working model, complete with carrying case. Has electric heating element, thermometer, switch box, and two-speed SPEE-DEE-HEET. You can sell by practical demonstration.
WRITE TODAY—for sales plan and rebate schedule.

WRITE OR WIRE

The Williamson Heater Co.

Blower Division

397-A West Fifth Street CINCINNATI, OHIO

Mention AMERICAN ARTISAN in your reply—Thank you!

The Highest Grade Steel Furnace Made

THIS IS THE KIND OF LOCAL NEWSPAPER ADVERTISING WEIR DEALERS ARE USING

THIS illustration is a reproduction of but three of a new series of high grade human interest advertisements which have been prepared for the exclusive use of Weir dealers.

Weir dealers sell *Better Warm Air Heating*—they sell a higher grade furnace—they obtain from us *practical* and *attractive* advertising publicity on Better Warm Air Heating which stamps them as up-to-date warm air heating contractors.

A Bed-Time Story
"ONCE upon a time"—
two "bugaboos" to
ing. One was "Shivery Ro
the other was "Big Fuel
But improved furnace con-
struction and better meth-
ods of installation (includ-
ing the basic provisions of
the "Standard Code") have
brought warm air comfort
to a very high state of
efficiency, with advantages
not had in any other method of
heating. Today, it is in higher fave
than ever before.
[This Space for D
WHEN THIS BABY IS A GROWN-UP MAN,
WITH BABIES OF HIS OWN, THE SAME
WEIR FURNACE THAT WARMS THIS
HOME TODAY, WILL PROBABLY BE STILL
"ON THE JOB AND GOING STRONG."
"If You Could Color The Air in Your Home"
THIRTY-FIVE year-old WEIR STEEL
forty-year-olds are not exactly rare.
And they are being built much better toda
build them when those "Old Timers" wer
More is known about STEEL. Better qu
pose are used. We've learned how to
Big machines even rivet cast-iron to S
WEIR does it). Double casing-rings a
clusive WEIR water heater is more
fit practically air-tight.
More moisture comes from the hum
proved. The most advanced kno
WEIR practice
And people are increasingly appre
warm air, as provided by WEIR.
[This Space fo

WEIR—AMERICA'S SUPREME WARM AIR FURNACE
"If You Could Color The Air in Your Home"
"And the house is so much easier to keep clean with this WEIR Furnace"
"You see, it is made of steel and all seams are both welded and riveted so make them permanently dust, smoke and soot-tight.
"And it has double casing rings to keep out all basement dust and dirt—at least, that's what Dick told me when I commenced on the furnace the other day."
Women DO appreciate the cleanliness that is a feature of the WEIR, due to its construction. They like the fuel economy—which means less effort and attention during the day.
Many WEIR furnaces are sold this way, for delighted owners never tire of telling their friends of WEIR advantages
And they like the constant circulation and re-circulating of the air in their home—for there is no stagnant, lifeless air in the WEIR steel warm-air furnaced home. Let us show you HOW and WHY.
[This Space for Dealer's Signature]

WEIR DEALERS SELL COMFORT

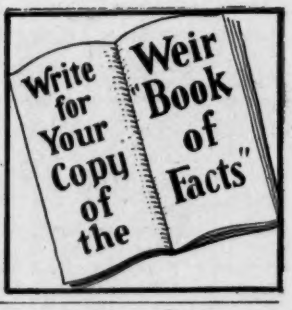
WHEN a man thinks about the heating problem he is thinking about *comfort* (for many years to come), *economy* (over a period of years), *cleanliness* (not for one season but permanently), and *the Weir dealer sells this performance.*

That's why this high class advertising was prepared—that's why Weir dealers make better profits on their warm air heating installations.

It's a fact that Better Warm Air Heating at a higher and more profitable price is easier to sell than a competitive installation.

Have us tell you more about how it is done.

THE MEYER FURNACE CO.
PEORIA-ILLINOIS



American Artisan
The Warm Air Heating and Sheet Metal Journal

Vol. 98 CHICAGO, JULY 6, 1929 No. 1

WANTED: SALESMANSHIP

THAT the farming community offers a tremendous market for sheet metal products and for the services of the sheet metal contractor is evidenced by the results of a survey made recently by the Sheet Steel Trade Extension Committee in order to secure data on the status of roofing.

The first question asked brought out the extent to which the various types of roofing are in use in the United States today, and a tabulation of the answers resulted in revealing some very pertinent facts. In this connection the question was also asked regarding what type of roof would be used in re-roofing. Figures in the first column below give the picture as it is; those in the second column show how many farmers would re-roof with the same material that was on the building if given a choice:

	Per cent	
Wood shingles	44	25
Galvanized sheet	33	46
Composition	18	22
Slate	5	4

Then a question was asked designed to bring out the degree of satisfaction obtained from the type of roofing that had been in use.

	——Per cent——		
	Poor	Fair	Good
Wood shingles	12	26	62
Slate	3	9	88
Galvanized sheets	5	14	81
Composition	18	16	66

Here's a fact that stands out very prominently and is perhaps one of the most important revelations that the sheet metal industry has had: Only 22 per cent of the farmers employ the services of roofers to apply their roofing. The survey revealed that 78 per cent make their own application.

Here are figures that reveal the fact that sheet metal contractors are now getting only 22% of the possible farm sheet metal roofing business. The Sheet Steel Trade Extension Committee, Terminal Tower Building, Cleveland, Ohio, recently made a survey into conditions as they exist with regard to all types of roofing on farm buildings.

They found that 78% of the farmers apply their own roofing, chiefly because they have not been approached by the sheet metal contractor and sold on the idea of using sheet metal properly installed for protection against lightning and rust.

Considering the 33 per cent galvanized sheet and the 5 per cent slate roofing as properly the sheet metal contractor's work, the sheet metal contractor is only doing at the present time 22 per cent of the possible work in his own legitimate field. Certainly if salesmanship were needed anywhere, it is in the sale of galvanized iron roofing materials to the farmer. This job of selling should be considerably easier than most contractors imagine when we consider the "Degree of Satisfaction" figures as these are given.

Perhaps the lack of energetic salesmanship on the part of the sheet metal contractors is responsible for the condition revealed by the following set of figures. "Where do the farmers buy steel roofing?" They are very illuminating.

	Per cent
Hardware stores	42
Lumber yards	27
General stores	10
Mail order houses	4
Manufacturers	8
Other sources	1

If we can take the figures given as an indication, and their authority gives us no reason to doubt their authenticity, the fact is very plain that the farmer represents a tremendous market for sheet metal roofing and for the services of the sheet metal contractor. And furthermore, the main requisite to capture this market is salesmanship. Mail order house and manufacturer direct sales are not the bogies they are often represented to be. According to the figures, only 8 per cent and 4 per cent respectively of the sales made are made through the two channels mentioned.

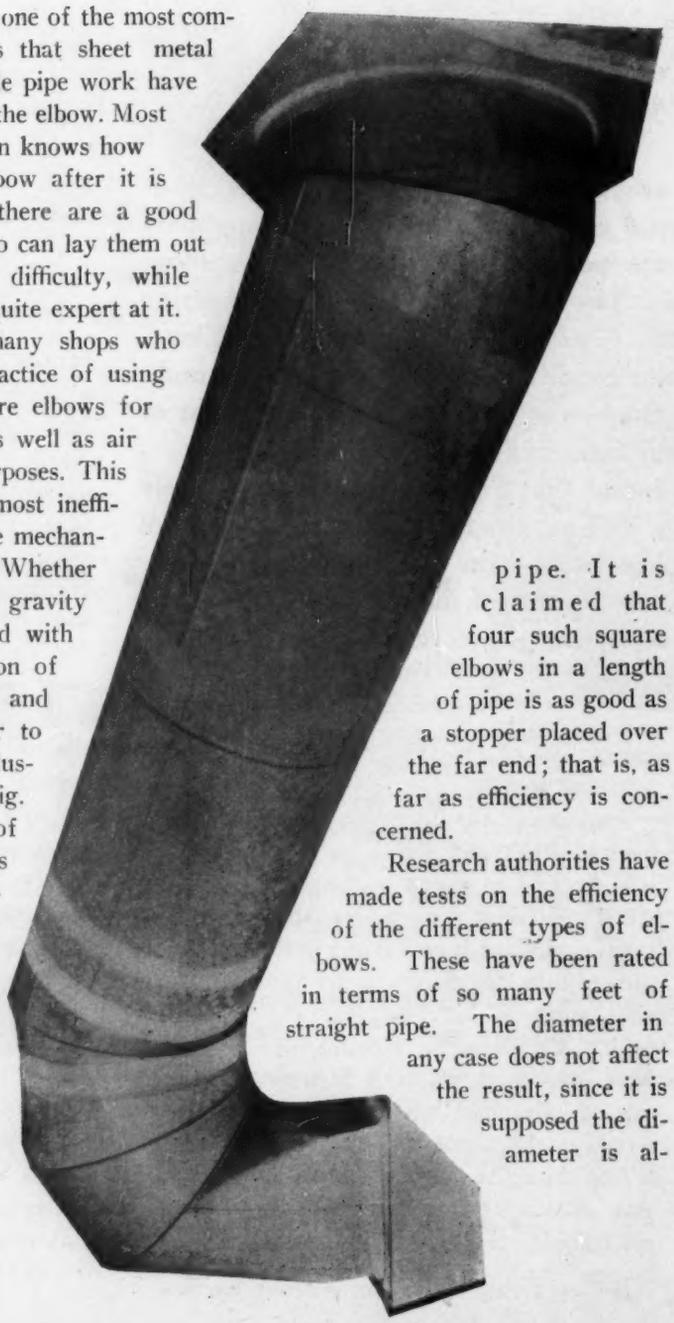
It is very clear that the sheet metal men would profit by an energet effort to go after this farm roofing business. Then, too, once on the farm, he has a splendid opportunity to pick up other sheet metal work, such as repairing machinery and tools of sheet metal.

To DESIGN an ELBOW *Requires* ACCURATE KNOWLEDGE *of* FRICTIONAL RESISTANCES

By O. W. Kothe

POSSIBLY one of the most common fittings that sheet metal men who handle pipe work have to deal with is the elbow. Most every tradesman knows how to make an elbow after it is laid out, and there are a good many folks who can lay them out without much difficulty, while not a few are quite expert at it.

There are many shops who still make a practice of using two-piece square elbows for smoke pipes, as well as air for various purposes. This is one of the most inefficient fittings the mechanic meets with. Whether the flow is by gravity or is accelerated with a fan, the action of the air, smoke and gases is similar to the arrows in illustration "A," Fig. 14. The heel of the elbow causes the flow to rebound and it therefore retards the flow in the main pipe. It is claimed that four such square elbows in a length of pipe is as good as a stopper placed over the far end; that is, as far as efficiency is concerned.



Showing a Practical Application of the Correct Method of Making an Elbow

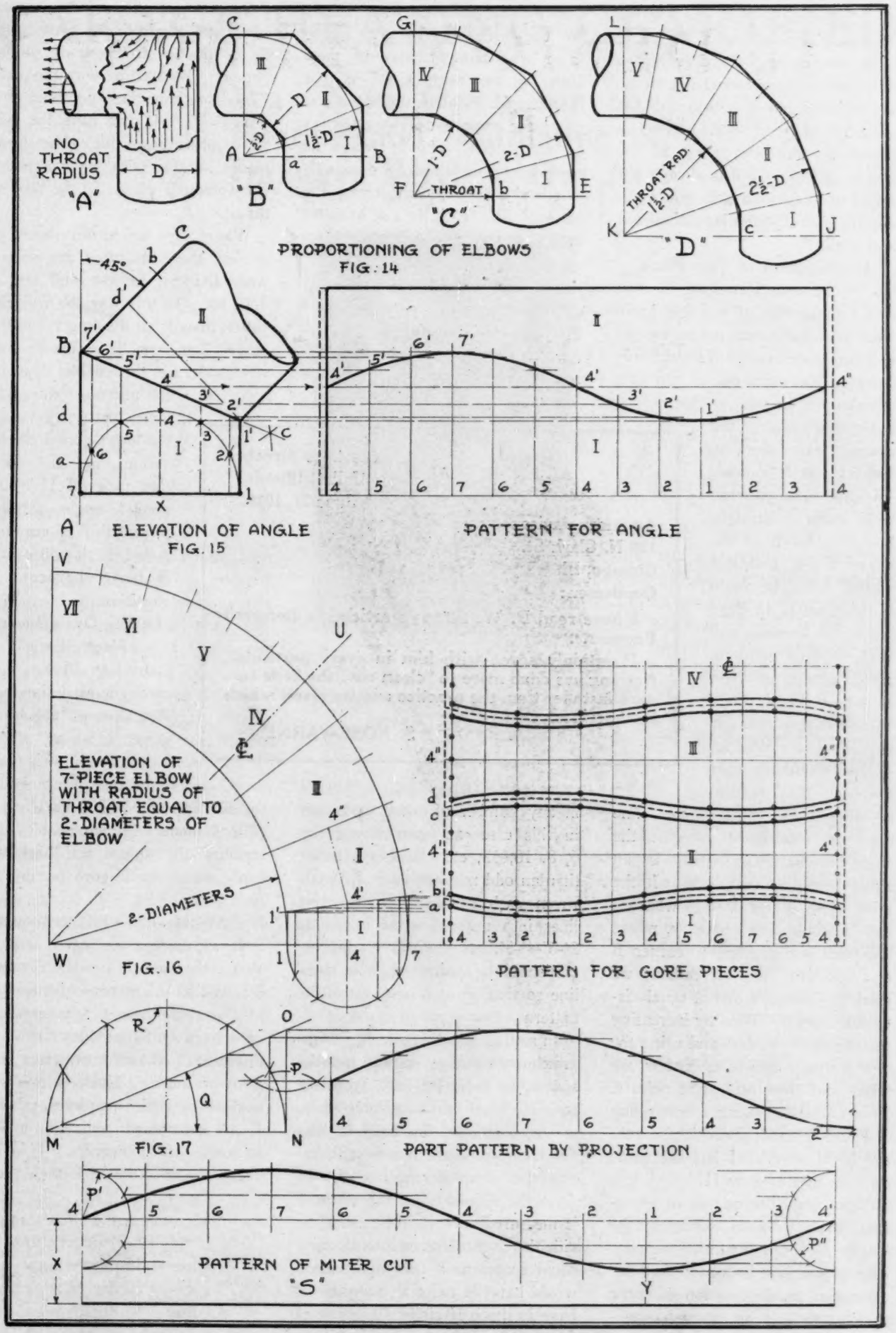
Research authorities have made tests on the efficiency of the different types of elbows. These have been rated in terms of so many feet of straight pipe. The diameter in any case does not affect the result, since it is supposed the diameter is always assigned as becomes the work it must perform. It is only by enlarging the diameter above this selected size that the friction would be reduced, because the velocity would be reduced. The following table shows the results of these tests.

Resistance for 90 Degree Elbows

Radius of throat of elbow in diameter of pipe, square throat	Number of diameters of straight pipe offering equivalent resistance, 130 diameters of pipe
¼	67.0
½	30.0
¾	16.0
1	10.0
1¼	7.5
1½	6.0
1¾	5.0
2	4.3
2½	4.5
3	4.8
3½	5.0
4	5.2
4½	5.5
5	5.8
5½	6.0

Thus we see that if we have a pipe, say 12 inches or 1 foot in diameter, a square two-piece elbow as at "A," Fig. 14, it will consume as much resistance to the flow of material as 130 feet of pipe. However, if the pipe were 15 inches in diameter, we would have 130 diameters or

$$\frac{15 \times 130}{12} = 162.5 \text{ feet of pipe.}$$



Designing and Laying Out of Elbows

the above rule to find the number of spaces in the elbow.

In memorizing the degrees the miter line inclines to and not knowing on what rule it is based, that is a slavish piece of work. When a person forgets one figure, all the rest is useless. So it is always better to use a method that works under any and all conditions of elbows and angles.

Development of Two-Piece Angle Patterns

No doubt, one of the first problems most tradesmen get to lay out is a two piece angle. Here we only consider the thickness of the line, representing comparatively thin metal or the neutral axis line of heavier metal is used. The pipe is supposed to bend from a straight line in point B as the angle A-B-C indicates in Fig. 15. The angle in this case is 45 deg., but it can be made any angle desired so long as too abrupt an angle is not produced. Then an added gore piece or two should be filled in.

Now no matter what the bend B-C is from a straight line, the miter line must be established to split the angle in half, so there is an equal bevel on each side of the gore. This is best done by what we call "bisection" in geometry, where we place our dividers to corner B and use any span as radius; we mark the points, a and b, equal distances from B. Then by increasing the radius of dividers and using the new points, a and b, as centers, we strike and cross arcs as at point c. This enables drawing a miter line B-c and it exactly divides so that the bevel of gore I has the same slant as that of gore II.

Next draw the outline of elevation, having 1-7 in diameter; the length 1-1′ can be made at any length, just so it is not too long for convenient handling or too short for working up. If we pass a horizontal line as 1′-d, also 1′-d′ square with the sides of gore I and II, we see the distance 1-1′, 7-d, is the same as a straight piece of pipe. Here we see the heel d-7′ is that much higher than the throat 1′, and this is the angle 1′-d-7′ we must cut on our pattern. This is always the condition we must find for any angle or elbow before we can develop the pattern. We call it the rise of miter line and it is this that always requires close attention.

Our next step is to describe a half circle as becomes the diameter of the pipe, being careful that the circle comes tangent with the points 1 and 7. Then divide this semi-circle in any number of equal parts, six in this case—an even number as 6, 8, 10, 12, etc., is always better than an odd number, as 5, 7, 9, etc. From each of these points erect lines into miter line as in points 2′-3′-4′-5′, etc. Observe, this establishes the points on the miter line so that we can now unroll the pattern.

In setting out the pattern, for approximate accuracy you can pick the spaces, as 1-2-3-4-5, etc., from the semi-circle of pipe and step them off on a straight line as 4-4. But for accurate results it is best to figure the circumference, as 3.1416 times the diameter, and this distance is measured as 4-4. After this, divide the circumference into as many equal spaces as a full pipe section would have, or twice as many as we have in the half circle. Erect lines from each of these points and then from each point in miter line square over horizontal lines, cutting off those lines in stretchout of similar number. By starting with the point 4′ and marking these points in pattern as 4′-4′-4″, we have the side lines and the seam line. The seams placed on the sides make a better elbow than if placed in the heel or throat.

Where it is inconvenient to project the lines, they are picked with dividers, as x-4, and set, as 4-4′, etc. In this way the full elevation lines from the base 1-7 to the miter line are transferred into stretchout, and this enables drawing the miter cut line. The lower pattern I is for the lower gore I of elevation, and the piece that falls off II is the second angle pattern. When this is cut and rolled up, it will exactly make the angle of elevation.

Laying Out a Seven-Piece Elbow

In Fig. 16 we show the general design and development for a seven piece elbow, whose throat radius is two diameters. Here 1-7 is the diameter and W-1 is made equal to 2 diameters, which enables describing the throat and heel arc. Since we desire 7 gore pieces, we simply say:

$7 \times 2 = 14 - 2 = 12$ equal spaces.

If we draw a 45 degree line, as W-U, this will bisect the distance 7-U and U-V, and consequently half of the above spaces are necessary or 6 from 7 to U. Many firms use this type of elbow for most any purpose or angle. Thus, if a slight angle is desired, two pieces, as gore I, are assembled, and this makes an angle of 15 degrees. If a 30 degree angle is desired, then three gore pieces are used. In fact, the numerous angles that can be made of this elbow pattern are:

2 gores = 15 degree angle.
3 gores = 30 degree angle.
4 gores = 45 degree angle.

(*Continued on page 26.*)

616 Cass Street,
Joliet, Illinois,
June 27, 1929.

American Artisan,
139 N. Clark St.,
Chicago, Ill.
Gentlemen:

I have read R. W. Strong's article on Deferred Payments.

I certainly agree with him in every particular. Nothing has done more to "clean out" the little furnace installer than the practice and its result which he describes.

S. ROSEWARNE.

GARAGE HEATING CLARIFIED

Way Now Open for the Heating and Ventilating of Garages With Warm Air

E. B. Langenberg

Member Garage Heating Committee

IN MAY, 1928, the National Fire Protection Association adopted tentative regulations governing the construction and operation of bus garages prepared by its Committee on Garages, which had the following personnel: H. E. Newell, chairman; K. W. Adkins, F. H. Alcott, E. P. Boone, K. B. Brier, E. K. Campbell, A. M. Daniels, W. K. Estep, R. H. Goodwin, Louis Harding, G. C. Hecker, W. F. Hickey, A. D. Knox, R. C. Loughead, Ray Nelson, I. Osgood, R. E. Plimpton, A. M. Schoen, H. S. Smith, John Stilwell, J. F. Templin, J. S. Trump, W. B. White and Wm. P. Yant.

An abstract from the code consisting of Sections 15 to 19, prepared jointly by a committee of the Society consisting of E. K. Campbell, chairman; W. H. Carrier, E. B. Langenberg and Thornton Lewis, appears in the following paragraphs:

Section 15

(a) Heat generating plants should preferably be located in a detached building. If within the garage, the heat generating plant shall be placed in a separate room used for no other purpose and cut off horizontally and vertically from all other parts of the building by reinforced concrete walls not less than 6 inches thick, or masonry walls not less than 8 inches thick.

Openings in such walls shall be restricted to those necessary for heating pipes and ducts, which openings shall be made tight in a manner to provide for expansion and at the same time prevent air passing through the walls. Entrance to room containing the firing space shall be from the outside only.

All air entering the heat generating plant for combustion purposes shall be drawn from outside the building.

(b) Sufficient heating capacity shall be provided to maintain an inside temperature of not less than 40 deg. fahr. in the coldest weather and to maintain a temperature of not less than 35 deg. at the warm air inlet when the ventilating system is in full operation for flushing purposes.

(c) No method of heating shall be used which permits fire in the garage or in any communicating room.

(d) Motors used in connection with heating system shall be of the constant speed type. All switches and motors shall be of approved design and installed in compliance with the National Electrical Code. Polyphase motors shall be protected against single phase operation.

(e) The use of steam or hot water heating systems by either direct or indirect radiation is permitted, provided the requirements of the ventilating section of these regulations are complied with. Inside air inlets for indirect radiation shall not be higher than 2 feet above the floor.

(f) Unit heaters employing steam or hot water are permitted provided the requirements of the ventilating section of these regulations are complied with.

(g) Steam blast systems with central fan and coils together with

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Presented at the semi-annual meeting of the American Society of Heating and Ventilating Engineers, Bigwin Inn, Lake-of-Bays, Ontario, Canada, June, 1929. Reprinted from A. S. H. V. E. Journal, Section of Heating, Piping and Air Conditioning, May, 1929. Copyright 1929, American Society of Heating and Ventilating Engineers.

ducts are permitted provided the requirements of the ventilating section of these regulations are complied with. The heating coils of such systems shall be separated from the firing space by masonry walls at least 8 inches thick.

(h) Warm air furnace blast systems of heating are permitted provided the requirements of the ventilating section of these regulations are complied with. The air space surrounding the furnace within the heating chamber shall be separated from the firing space by a masonry wall at least 8 inches thick or other wall of material and thickness which may be approved by the Underwriters. This wall may be formed in part by the furnace front which must be not less than ¼ inch thick, of steel or cast iron and this furnace front may be pierced only by the feed and ash pouches of the furnace, and by clean-out doors opening into the combustion space or smoke passages. Access doors through either brick wall or furnace front shall not be permitted. Warm air furnaces other than blast systems shall not be permitted.

(i) Positive recirculation of 1 cu. ft. of air per sq. ft. of floor area within the garage shall be provided in all garages having an average ceiling height of not more than 15 ft. and in all garages having greater ceiling height than 15 ft. the volume of air recirculated shall be increased in proportion to the increase in height. The return air openings in such recirculating systems shall be not more than 2 ft. above the floor.

(j) In central furnace fan plants, not less than 5 per cent of the air moved by the fan shall be taken direct from outside of the building through a duct which shall deliver the outside air to a point near the floor on which the fan rests; the duct shall be open at all times and the air supply which is provided shall be without control.

(k) All fans used for recirculating air within the garage or exhausting air from the garage shall be of non-sparking type.

Section 16. Ventilation of Storage Sections

(a) These regulations shall apply to the following garages:

1. Garages housing 35 or more motor vehicles with 3 or more walls pierced with openings.

2. Garages housing 25 or more motor vehicles with 2 walls pierced with openings.

3. Garages housing 4 or more motor vehicles and located above ground, but having less than 2 walls pierced by openings and exposed to the outside.

4. Garages housing 4 or more motor vehicles and located below the level of the ground.

(b) Natural ventilating may be employed where it is practicable to maintain open windows or other openings at all times. Such openings shall be distributed as uniformly as possible in at least two outside walls. The total area of such openings shall be equivalent to at least 5 per cent of the floor area.

(c) Where it is impracticable to operate such a system of natural ventilation, a mechanical system of ventilation shall be provided. This system may be combined with the heating system or may be an entirely separate installation.

(d) Positive provision shall be made for either the inlet of 1 cu. ft. of air per minute from out-of-doors for each square foot of floor area, or for removing the same amount and discharging it to the outside as a means of flushing the garage.

(e) For the purpose of these regulations, positive means of handling air shall be understood to mean a power-driven fan or fans of sufficient capacity to move the required volume of air.

(f) Where positive systems of exhausting air are used, the exhaust openings shall be not more than 24 inches above the floor and shall be not more than 50 ft. apart.

(g) Garages having a capacity of not less than 4 or not more than 35 cars within the scope of these regulations may consider air exhaust stacks as positive, provided they have not less than 15 sq. ft. of steam heating surface for each square foot of duct area, and not less than 1 sq. ft. of free area through both heating coil and duct for each 350 sq. ft. of floor area. Such an exhaust duct shall discharge above the roof and extend in any case to a height of not less than 15 ft. above the heating coils.

(h) Where mechanical systems of introducing outside air are used, and where air is recirculated the air shall be delivered horizontally and in sufficient volume and with sufficient velocity to secure distribution to all parts of the building. The height of the air inlet opening shall be such that the air will be discharged above the top of the vehicles.

Section 17. Repair Shops

(a) Repair shops shall be ventilated as required for garage storage sections, except that mechanical means shall be provided for both the inlet and exhaust of 1 cu. ft. of air per minute per square foot of floor area.

(b) In connection with engine testing it is recommended that the engine discharge direct to outdoors through a straight duct or pipe of incombustible material, and of suitable size, installed as an extension of the exhaust pipe or muffler, in which case the mechanical system for inlet or mechanical system for exhaust may be omitted.

Section 18. Fuel Burning Appliances

(a) Steam generators for tire vulcanizing, for oil and grease removal and for purposes other than space heating water heaters, and other fuel burning appliances such as forges shall not be installed within bus operating section or within carpenter or paint shop.

Section 19. Inspection and Repair Pits and Trestles

(a) Elevated trestles or hoists are preferable for this service. If pits are used, they shall be continuously ventilated by a system independent of the main garage ventilating system. Such pits shall be cleaned at least daily and no accumulation of oil and grease permitted. Permanent illumination shall be provided.

Stressing IMPORTANCE *of Giving* COMPLETE HEAT LOSS DATA *For* Heating and Ventilating Requirements

Accompanying Data Sheet Shows Why Adequate Information Is Necessary

By
Platte Overton

THE data sheet form shown herewith should be of interest to the warm air heating man figuring warm air fan blast installations.

An attempt to design such a system without complete data may be compared to the general who plans a battle without a map. With a completed data sheet we will know where we are going, how far it is, and when we will arrive. No guessing.

The warm air fan blast system must be right. Steam systems may fail to function or blow the occupants out of their chairs (recent catastrophe in hospital from leaking steam pipe), and the public will smile tolerantly, but the warm air blast system, like Caesar's wife, must be above reproach, and it may be so, but the designer must not overlook the slightest detail.

With a study of this data sheet the reader will note that the items 4-5-6-7 are the various exposed surfaces with their constant and factor. Items 15-16-19-20 should contain the B.t.u. loss for these surfaces. The B.t.u. loss in all cases is the square feet of exposed surface, times the factor for that surface.

For the factor we multiply the constant by the temperature rise.

It is hoped that contractors writing in for information will heed what Mr. Overton has to say about giving full information. And they can do this by using the accompanying data sheet.

The temperature rise is the difference between the temperature inside the room and the outside temperature.

Example: If the inside temperature is 70 degrees and outside temperature is 10 degrees below zero, our temperature difference is 80. The designer should avail himself of tables giving the constants for the various surfaces, and the factors may be computed as shown above.

A 12-inch brick wall not plastered has a constant of .32, and with a temperature rise of 80, we have .32 times 80, equals 25.6 for our factor. If we have 1,000 square feet of wall exposed, we have 25.6 times 1,000 equals 25,600 B.t.u. loss.

In the estimate of the temperature rise, the designer must remember that room temperatures are generally given and these temperatures are those that must be maintained at the breathing line. In rooms with ceilings not over 10 or 12 feet in height these temperatures are our mean, but in rooms with high ceiling, such as churches, theaters or factories, the temperature rise is greater.

As an example, a church with a 20-foot ceiling and 70 degrees to be maintained at the breathing line, with 10 degrees below zero outside, would require a temperature rise of minus 10 to 82 degrees. The designer should obtain the graph giving the mean temperature for ceilings over 10 or 12 feet in height.

Grand Rapids and Muskegon Hold Joint Meeting

An idea that has been in the back of President Ike Lammers' head for some time culminated one night recently when the Grand Rapids Association held their regular monthly meeting at the Cottage Inn, Muskegon, having as their guests

N____% NW____% NE____% W____% E____% SW____% SE____% S____%

Exposure Factors

Based on_____°F. Cold Weather & Prevailing Winds From_____

Bldg. Date

Dist No.

or Loc. Twp. Co.

Bldg. H. & V.

Archt. Engr.

Rooms No.					
Use					
MEASUREMENTS					
1. Room Dimensions					
2. Cubic Feet Space					
3. Room Floor Area					
4. Floor Const. & Factor					
5. Ceiling Const. & Factor					
6. Window Const. & Factor					
7. Wall Const. & Factor					
8. Exposed Sash and Door Perimeter, equiv.					
9. Leakage B. T. U. per ft. of Perimeter					
10. Expd. Wall Gross Area					
11. Expd. Window Gross Area					
12. Expd. Wall Net Area					
13. Exposure Direction					
14. Room Temperature					
HEAT LOSSES					
15. Wall Loss B. t. u. per Hr.					
16. Window Loss B. t. u. per Hr.					
17. Subtotal Loss B. t. u. per Hr.					
18. Expos. Allow. B. t. u. per Hr.					
19. Floor Loss B. t. u. per Hr.					
20. Ceiling Loss B. t. u. per Hr.					
21. Leakage Loss B. t. u. per Hr.					
22. Total Heat Loss					
23. Deduct for Heater Size					
24. Heater Building-loss Load					
SERVICE					
25. Air Supply C. F. M.					
26. Recirculation C. F. M.					
27. Air Supply Inlet Temp.					
28. Air Supply B. t. u. Service					

Chart Showing Type of Data Required to Calculate Heat Losses

the sheet metal, roofing and heating contractors of Muskegon.

Twenty-one men gathered at Harry Rhodes' office at 5:30 in the evening and drove from there to Muskegon, where they were met by eight contractors from the Saw Dust City. A splendid dinner was served at the Cottage Inn, during which community singing kept up the spirit of good-fellowship. Following the meal, President Lammers called the meeting to order and proceeded with the usual routine of business.

A discussion of the summer outing of the Local resulted in the appointment of a committee to make the necessary arrangements, with the recommendation that Morrison Lake be chosen as the location.

State Secretary Frank Ederle was called upon to make a few remarks and in his talk outlined the activities of the state association and its local associations. He very convincingly told the Muskegon fellows just what they were missing by not having an organization in their city. A brief outline of the activities of the Allied Construction Industries of America concluded his talk.

Each of the guests from Muskegon expressed his appreciation of the opportunity of meeting with the Grand Rapids association, and also stated that undoubtedly some concerted action would be taken in the near future for the organization of the Muskegon contractors.

During the meeting the boys were all well supplied with cigars through the courtesy of the W. C. Hopson Company and the Behler-Young Company, both donating a box of cigars. About 11 o'clock the meeting adjourned, marking down in the archives of the association another very successful meeting through the efforts of the hard working president, Ike Lammers.

Howard Miller Says:

LONG DATINGS ARE CURSE of Warm Air Heating Industry

MR. MILLER is President of Frederick Sabin & Company, Inc., 237 Bread Street, Philadelphia, Pennsylvania. His article is in response to that of R. W. Strong of the Homer Furnace Company, on Deferred Payments appearing in the June 22nd issue of AMERICAN ARTISAN.

Mr. Miller thinks that where the deferred payment plan is employed, unusual care should be exercised in looking up the credit standing of the customer. He does not sell to installers who use deferred payments in their business, so he says in this article.

I HAVE read R. W. Strong's article in your June 22nd issue with interest. He is to be complimented, and if the time-payment seller heeds Mr. Strong's warning and sells for cash, and only to responsible buyers, especially in the furnace industry, the industry will soon be free from its troubles, and furnaces can be sold to reliable dealers and sold at a profit for all concerned.

Does Not Sell on Deferred Payments

If the maker of furnaces will stop selling his product to the so-called distributor on long datings, and if the distributor will stop selling to dealers who sell to users on time payments, it will go a long way toward righting the present hectic situation.

Some furnace maker will probably say, "We must give September 1st dating. We must consign furnaces to some dealers."

Well, I am a furnace distributor —at least I am called by that name by some people. I sell more than fifty cars of furnaces in a year in this part of the country. I have never consigned a furnace, I have never given dating, I have never taken a note, I have never taken a trade acceptance. My terms are 30 days net or 2 per cent 10 days. While I do not and will not sell furnaces to a dealer who re-sells to a time-payment purchaser, I have credit losses, but I do not have as much credit loss as I surely would have if I did not care how my dealers re-sold the furnaces they buy of me.

Selling Costs at a Minimum

My competitors in this market seem to worry only about getting the order. They do not seem to care about anything else; getting the money, for instance, or for making a profit on the goods they sell. They beat me on price and spend a lot of money to sell goods. I do not have *any* salesmen, so my selling cost *must* be less than theirs. I *can* regulate my advertising cost, but to have traveling men costs around $5,000 per year per man, which, of course, must be put on the selling price.

I have refused to take into my warehouse at any time any furnaces that I could not pay for in ten days. My warehouse is full of furnaces right now, but I can bid them "Good morning" when I come in and say to myself, I had much rather see them where they are than to have sold them on long credit or to an installment seller on *supposed* 30 days' credit time-payments. No, sir, not for me. Time-payments are for financial wizards, which I am not. More power to Mr. Strong.

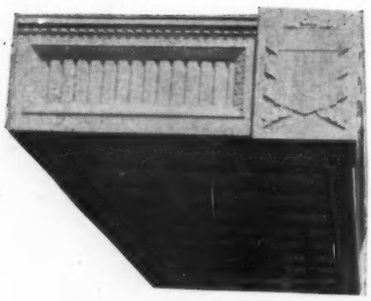
You have invited comment. You can print this or throw it in the "basket," or delete it if you think it might stiffen some maker's or dealer's spinal column, by printing any part of it.

Has New Low Pressure Rotary Blower

The P. H. & F. M. Roots Company, Connersville, Indiana, has just issued a new 16-page bulletin, No. 22-B1, on low pressure type rotary positive blowers.

The bulletin covers the new Roots modernized blowers equipped with Timken, SKF and Hyatt bearings and replaces the former Bulletin 1011 issued by this company.

With this bulletin the Roots Company is including another new bulletin, 10-B1, "Covers Industry Like a Blanket," and a book on "Engineering Tables," all bound in a loose-leaf cover. This combination of three pieces contains much general engineering data which proves valuable for reference. Complete catalog on request.



World's Largest - I

— CHICAGO ST

Offers

Excellent Example

Possibil

In

SHEET M

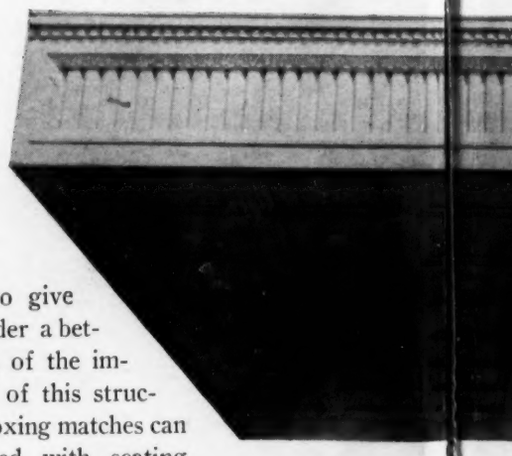
By GEORGE D

"LOOP Ticket Office of the Chicago Stadium." Thus reads a sign occasionally suspended across Clark Street, between Washington and Randolph, Chicago, and a little to the south of the City Hall Square Building, which houses AMERICAN ARTISAN.

Having purchased a ticket, the possessor thereof is entitled to a seat in the world's largest and most magnificent indoor arena—the Chicago Stadium, in the 1800 block of West Madison Street.

I say it is the largest structure of its kind in the world because it is just that, covering an area of 300 x 266 feet laterally and rising majestically into the air 110 feet, with a total volume of 9,256,800 cubic feet. The seating capacity of the building is 25,000, and all seats are arranged so that every person in the audience has an equal chance of seeing what is taking place. There are no bothersome posts to obstruct the vision.

Perhaps some comparisons will serve to give the reader a better idea of the immensity of this structure. Boxing matches can be staged with seating capacity for 25,000 spectators. A football field with a seating capacity of 18,000 can be accommodated without overtaxing the space. International bicycle races conducted over an eight and one-half lap track permit seating accommodations for 20,000. Skating races



An Inspiration for Sheet Metal Contractors is contained in this Delineation of Sheet Metal

Indoor Arena
STADIUM

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METAL

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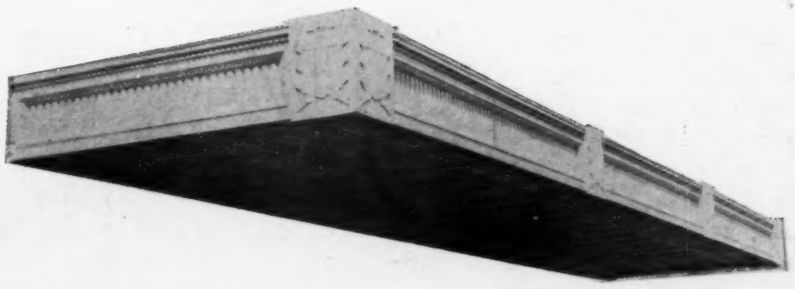
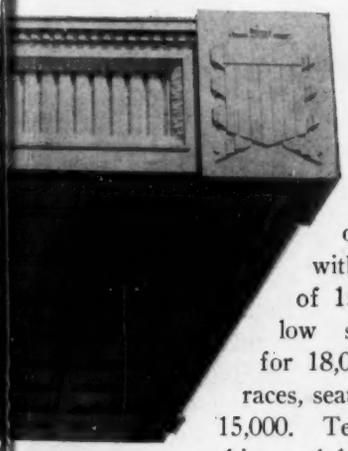




or hockey games, with an ice surface of 150x250 feet, allow sufficient room for 18,000. Motorcycle races, seating capacity of 15,000. Tennis championships and basketball championships, 18,000 seating capacity.

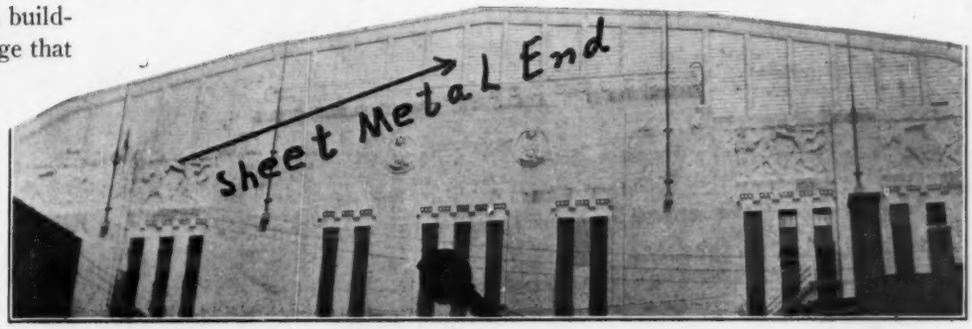
This new structure, now nearing completion, is even larger than the new Madison Square Garden building in New York. It is so large that an 8-story building could be constructed within its walls and still fall short of the suspended trusswork of the mammoth vaulted roof.

All this preliminary description serves but to emphasize the important part that sheet metal has had in the development of this building. There are three entrances on Madison Street and three on Wood Street. One main entrance in the middle of the block on each street and two smaller ones. Over each of these there is hung a beautiful sheet metal canopy. There are six of these canopies in all and they were erected by the Sykes Sheet Metal Company, 6036 South State Street, Chicago, members of the Associated Sheet Metal Employers' of Chicago. These canopies are shown in the accompanying illustrations.

In addition to the erection of the canopies, the ends of the roof, illustrated herewith, were also constructed of sheet metal and erected by the Sykes Sheet Metal Company. In all there were 280,000 pounds of sheet metal used for the two purposes described. Then, too, there are the ventilating system openings on the roof. There are six of these and they were constructed of sheet metal.

Twenty-three tons of air per minute are conditioned by the air-conditioning system installed in the Chicago Stadium by the Carrier Engineering Corporation of New-

(*Continued on Page* 24)



Describing Some Observations on Performance on Both Gravity and Forced Warm Air Systems

The COMBINATION GRAVITY and FORCED AIR SYSTEM

By
J. C. Miles

THE warm air furnace industry has been rather slow to take hold of anything new. This may be attributed to lack of technical knowledge, but it may not be far amiss to assume that the principal reason is in the fear of what it may do to their production. If something new was introduced that would necessitate changing furnace patterns or production, it would be only human to fight shy of it.

For the past ten years (and it is all of that) the furnace industry has been urged to the use of fans, and it is only just now that the thing has taken root. But now that we are interested in fans and can see no intereference in our patterns or productions, to make the best of the furnace fan would seem wise.

Mr. Miles is Vice President of the Warm Air Furnace Fan Company, Cleveland, Ohio, and is endeavoring to interest the warm air heating industry in an improved warm air heating system more commensurate with the possibilities. He has laid his cards on the table and invites attack. This article is intended as a challenge. Let him who takes issue enter discussion.

The Possibilities in the Combination System Are Far-Reaching

First of all, we have to view the season's heat requirements. When the low temperature is estimated or reckoned at zero, the average temperature is plus 40. If we will eliminate 75 per cent of the heating season, which will include the warmest weather, we find that the average is plus 32 degrees F. Or again, if we will take the coldest days into a period of 10 per cent of the heating season, we find that the average temperature is plus 20 degrees F. In other words, taking 4,800 hours as the temperature period and by deducting 480 of the coldest hours, we find that the average temperature is plus 20 degrees F. Therefore, if we are to maintain 70 degrees F. indoors, our temperature difference is 50 degrees F., 90 per cent of the heating season. With this as a basis, we can then design the combination system to fit the requirements over the whole season.

Fan Capacities and Gravity Limitations

Bulletin 120 figures 47 and 48 shows conclusively the limitations of a gravity system but the test also shows that the fan system is limited only by the air volume and flue draft.

Let us take the gravity system near the efficiency peak for this heating period with the 20 cold days taken out. Then supply the proper size fan for an increased capacity equivalent to the increased heat requirements. Here, then, we have the combination system. Gravity system for mild weather—forced air systems for cold weather—(this will include the heating up period also.)

This plan would reduce the entire system to 50/70 or 5/7 of the zero gravity system and render it more adaptable to the mild weather requirements.

Advantages of the Combination System

First—The air temperature in the smaller duct would by necessity have to be a little higher, thereby giving greater motive head for better circulation during mild weather. (This is very desirable.)

Second—The exposed area of the pipe would be less (5/7) hence the radiant heat loss less.

Third—The allowance for establishing circulation would be unnecessary. The cold air that retards circulation would be instantly displaced by the force of the fan.

Fourth—The register temperature of the fan system would be lower than the peak load gravity system,

(*Continued on Page* 23)

thereby conserving heat in cold weather.

Fifth—Forced circulation is subject to control which, as Dr. Hill wisely concludes, is the solution to the problem of air conditioning.

Fitting It to Standard Code

How the combination system will fit the Standard Code needs but one example to prove the point.

Assume a heat loss of 77,000 B. t. u. zero to 70 degrees F. — 90 per cent of the heating season would be 5/ of 77,000 or 5,500.

The Standard Code first floor pipe area for 5,500 B. t. u. is (55,000 divided by 110 =) 500 square inches.

It will be noted here that we have a gravity capacity for a 50 degree temperature difference, which temperature difference prevails less than 10 per cent of the heating season. The average temperature difference for the whole season is only 30 degrees, so it will be seen that normally we lower the gravity register temperature for the mean low and raise it for the mean high temperature, maintaining at all times sufficient area to fit the requirements.

For the fan system the pipe area for 77,000 B.t.u. would equal $\frac{77{,}000 \times 55 \times 14}{70 \times 300 \times 60} = 480$ plus. Hence, it will be seen that if the system designed as 5/7 of the Standard Code or a strictly scientific fan design the area and capacities are approximately the same.

Bulletins 120 and 141 show quite conclusively that the peak of efficiency of a gravity warm air furnace is at or about 4 pounds combustion, hence the furnace capacity for the suggested 90% period may be applied at this combustion rate and the fan system at a combustion rate slightly higher—at or near an efficiency peak for forced circulation.

Compared Grate Area Calculation

Full load fan system $G = \frac{77{,}000}{6 \times 12{,}000 \times .70 \times .90} = 1.7$ minus.

Average load gravity system $= \frac{33{,}000}{4 \times 12{,}000 \times .60 \times .80} = 1.7$ plus.

The author of this paper is endeavoring to interest the furnace industry in an improved warm air heating system more commensurate with the possibilities. He has laid his cards on the table and invites attack. This article is intended as a challenge. Let he who takes issue enter discussion.

The author thinks he sees great possibilities for a long forward step through this combination principle, and if there is anyone in the heating industry who questions the practicability of these theories, he will greatly oblige by pointing them out. An open forum on this subject will do a lot of good.

Michigan Outing to Be Held at Idle Hour Club

The Idle Hour Club, St. Clair Flats, Michigan, has been selected as the location for the summer outing of the Michigan Sheet Metal and Roofing Contractors' Association. The tentative dates are Friday and Saturday, July 26 and 27, 1929, according to an announcement given out by Al Berschbach, Sr., chairman of the committee, immediately following a meeting of the committee at the Savoy Hotel, Detroit, last week.

It was not definitely decided whether to go by boat from Detroit on Friday morning or to leave from Mt. Clemens by special boat which would make trips at 10, 12, 2 and 3 o'clock. It is probable that arrangements will be made so that you can have your choice.

The Idle Hour Club is a private club and the committee is to be congratulated for having arranged this affair at so exclusive a place. There is a beautiful club house with pleasant surroundings; plenty of space for sports, wonderful eats.

Mr. Walter Sheets of the R. C. Mahon Company is vice-president of the club and it was through his efforts that the arrangement was made possible.

The rates at the club are $6.00 a day per person. This includes all meals and your room. A charge of $5.00 per family will be made to cover boat fare and other incidental expenses.

Reservations for this event should be made at once with Assistant Secretary D. H. Ederle, 1121 Franklin street, Grand Rapids. A check for $5.00 must accompany reservation.

Detroit Warm Air Heating Contractors Meet

More than thirty warm air heating contractors gathered at the Savoy Hotel, Detroit, recently to attend the June meeting of this aggressive and rapidly growing association.

Following the usual good dinner, President Howard Lofft called the meeting to order and introduced Wm. W. Busch, president of the state association. This was the first time since the organization of the group about two years ago that Bill had attended one of these meetings.

Bill stated that he was pleasantly surprised at the progress of the organization when he contrasted this meeting with the one he attended two years ago. Bill, in his usual capable manner, told of several of the advantages of organization work and used as an example his own Detroit Sheet Metal and Roofing Contractors' Association and the state association.

He outlined the present activities of the Detroit unit of the Allied Construction Industries and pointed out the advantages of the warm air heating contractors becoming affiliated. Several questions were asked and a great deal of enthusiasm toward the plan was evidenced. Bill concluded by extending an invitation to attend one of the board of directors' meetings to a committee of three warm air heating contractors. The invitation was readily accepted.

A general discussion of the proposed city building code which is now being drawn furnished the subject for the balance of the meeting. It was the consensus of opinion that the Standard Code should be incorporated in the Building Code, and a committee was appointed to interview the city building inspector and present the code for adoption.

WHO'S WHO, WHERE!

MT. CLEMENS, MICH.—The Michigan Stamping & Rolling Company has engaged in business and will do a stamping, rolling and die manufacturing business.

FERGUS FALLS, MINN.—The Keystone Engineering Co. has been incorporated with a capital stock of $100,000 to engage in the oil burner manufacturing business. The officers are: President, C. C. Rosengren; vice-president, F. E. Martin; secretary, N. H. Lidenberg; treasurer, H. A. Didenberg, all of Fergus Falls except Mr. Martin, who lives in Minneapolis.

ST. PAUL, MINN.—The Metropolitan Roofing & Cornice Works, 372 Rice street, has been awarded the roofing contract for Northrop Auditorium building at University of Minnesota.

LIVINGSTON, MONT.—Rays Shop has the contract for the warm air heating plant for the Congregational Church.

CEDAR RAPIDS, IA.—The Grissell Cornice Works, 614 South First street, East, has been awarded the sheet metal contract for the Becker business building.

The Hawkeye Tin Shop, 209 South First street, East., has been awarded the warm air heating contract for residence of Ira H. Winchell.

DES MOINES, IA.—The Backman Sheet Metal Works, 405 East Second street, has been awarded the sheet metal work on the high and grade school at Keystone, Ia.

DAVENPORT, IA.—The Davenport Metal Specialty Company, 1232 West Fifth street, has the warm air heating contract for residence of R. L. Naylor.

PORTLAND, ORE.—The Portland Sheet Metal Works, 742 Holgate, has been awarded the steel sash contract and the hollow metal door contract for women's building at the state penitentiary at Olympia, Wash.

LOS ANGELES, CAL.—The Hodge Sheet Metal Works, 5851 South Broadway, has received the contract for sheet metal work on the Sears-Roebuck mercantile building.

The H. W. Johns-Manville Company has been awarded the asbestos and sheet metal work contract for automobile plant of Ford Motor Company.

The sheet metal contract for Willard's cafe building has been awarded to Emil Brown Sheet Metal Works.

The National Cornice Works, 1323 Channing street has been awarded the sheet metal and hollow metal window contracts for C. E. Toberman office building.

The Vermont Sheet Metal Works has the sheet metal contract and the National Cornice Works the metal door contract for Preston Wright office building.

PASADENA, CAL.—The Jones Plumbing Co., 225 West Main street, has the sheet metal contract for R. M. Wig residence in San Marino, Cal.

JACKSON, MISS.—The Warburton Co., Yerger street, has the sheet metal contract for $1,000,000 Jackson Tower building.

GREENVILLE, N. C.—The J. A. Piper Roofing Co., 116 West Court street, has the roofing and sheet metal contract for $500,000 warehouse of American Tobacco Co. in Durham, N. C.

MARSHFIELD, ORE.—Kraus-Frazier, Inc., tinning works, has been incorporated with a capital of $5,000, by E. A. Kraus, Russell H. Frazier and B. F. Frazier.

PORTLAND, ORE.—The Oregon Heating & Ventilating Co., Security building, has been dissolved, G. V. Buckett retiring and business continued by G. V. Abbott.

William Harding has engaged in business under name of Portland Furnace Co.

CEDAR RAPIDS, IA.—Ilten & Taege, 325 4th Avenue W., have the warm air heating contract for residence of Herbert S. Stamats.

The Hawk-Eye Tin Shop, 209 S. 1st Street, has the warm air heating contract for residence of Ira H. Winchell.

DAVENPORT, IA.—R. Clausen, 617 W. 2nd Street, has the warm air heating contract for residence of Matthew Lawrence.

The Davenport Metal Specialty Co., 1232 W. 57th Street, has the warm air heating contract for residence of R. L. Naylor.

TULSA, OKLA.—The Nu-Way Furnace Co., 201 N. Denver, has the warm air heating contract for residence of Robert Bradshaw.

SAN FRANCISCO, CAL.—Robert Neilan, 59 Iris Street, has the sheet metal contract for mission building at Pine and Octavia Streets.

Morrison & Co., 74 Duoce Street, has the sheet metal contract for the Geary Street School.

SAN MATEO, CAL.—The Gaffligan Sheet Metal Works has the sheet metal work contract for service station of Associated Oil Co.

LOS ANGELES, CAL.—Paller & Goldstein have the contract for sheet metal work for Sidney Uhlman apartment building.

The Pacific Gas Radiator Co., of which C. O. Menig is secretary and treasurer, will establish a gas heating appliance plant in Houston, Texas.

GREENVILLE, S. C.—The Ramseur-Lee Co., 353 McBee Avenue, has been awarded the roofing and sheet metal contract for plant of North Carolina Finishing Co. textile plant in Yadkin, N. C.

ATLANTA, GA.—Claude A. McGinnis, 126 Krog Street, has the roofing and sheet metal contract; David Lupton's Sons Construction Co., Bona Allen Bldg., the contract for metal windows, and the Dowman-Dozier Manufacturing Co., 1314 Murphy Street, the hollow metal and fire door contract for Yaarab Shrine Mosque in Atlanta.

CHICAGO STADIUM

(*Continued from page* 21.)

ark, New Jersey. Located in the four remote corners of the roof structure are four complete central station air-conditioning units. Each of these is comprised of a spray chamber with its auxiliary equipment and a large centrifugal fan which connects to a sheet metal duct system through which the air is distributed to outlets located according to a careful design at points throughout the Stadium.

Passing through automatically controlled dampers into these spray chambers, 600,000 cubic feet of properly conditioned air per minute are delivered to the interior of the building—more than 23 tons of air per minute. A refrigeration system is included in this air-conditioning equipment with a capacity sufficient to make 600 tons of ice every 24 hours.

A complete story on the air conditioning system will appear in a later issue.

Another feature of the building, which has nothing to do with the sheet metal work, but which will prove an interesting piece of information to our readers, is the Mammoth Barton Pipe Organ, constructed especially for the requirements of this particular building at a cost of $150,000.

This great instrument, with open sound chambers permanently built into and suspended from the giant steel trusses of the high, vaulted roof, outstrips the largest pipe organ in performance.

The full volume of the organ is equivalent to that of twenty-five complete brass bands of one hundred instruments each, or a total of 2,500 orchestral pieces. It plays, simultaneously, 40 harmonizing snare drums, 16 violins, 12 saxophones, 4 bass drums, 12 flutes, 9 clarinets, 6 trumpets, 7 French horns and other essential instruments.

The musician wishing to express any form of musical interpretation, any mood of the human heart, can find the means for accommplishing it through the marvelous mechanism of this unique instrument. From the greatest volume, the organist can instantly subdue its vibration to that of a whisper.

The electric lighting system in the building is equivalent to that of a city of 20,000 population. A direct line from the Commonwealth Edi-

(*Continued on page* 25.)

"Monel" Metal

From J. F. Spata, care Monteray Apartment, Yakima, Washington.

Please tell me who makes Monel metal.

Ans.—The International Nickel Company, 67 Wall Street, New York City.

"Spence" Boilers

From C. W. Filby, Jefferson, Ohio.

Can you tell me who makes the "Spence" boiler?

Ans.—Pierce, Butler & Pierce Manufacturing Company, New York City.

Glass—"Sani-Onyx" and "Vitrolite"

From The Phoenix Company, Texarkana, U. S. A.

We should like to know where we can buy the Sani-Onyx and Vitrolite glass.

Ans.—The Sani-Onyx glass may be purchased from the Sani Products Company, 209 West Randolph Street, Chicago, Illinois, and The Vitrolite Company, 120 South La Salle Street, Chicago, Illinois, can supply you with the Vitrolite glass.

Porstelain

From Nat Bernstein, 56 Chestnut Street, Chelsea, Massachusetts; Chester Bailey, 357 Buckinham Street, Newark, Ohio; Wolff, Kubly & Hirsig, Company, 17 South Pinckney Street, Madison, Wisconsin; H. H. Vandiver, 520 Carson Avenue, Las Animas, Colorado; Fram Heating & Spouting Company, 23 Broad Street, Newton Falls, Ohio; The J. V. Helsel Company, 331 Seventh Avenue, East, Hendersonville, North Carolina; R. T. Pender, Inc., 41 Sutton Street, Lynn, Massachusetts, and Fort Myers Roofing & Metal Company, 943 Anderson Avenue, Fort Myers, Florida.

Please tell us who makes "Porstelain"—the sheet metal tile which is referred to in the article appearing on pages 168 to 170 of your June 22nd issue.

Ans.—Porcelain Tile Company, 228 North La Salle Street, Chicago.

Retinning

From Eugene Moyemont, Odell, Illinois.

Will you kindly inform me who does retinning, such as pans for steam cookers?

Ans.—Retinning Manufacturing Company, 3021 Greenview Avenue, and Thompson Bremer & Company, 1750 Carroll Avenue; both of Chicago.

Copper Wire Cloth

From Colonial Furnace Company, 16 North Twelfth Steet, Fort Dodge, Iowa.

Where can I buy copper wire cloth of No. 16 wire 3/8 inch mesh?

Ans.—F. P. Smith Wire & Iron Works, 2346 Clybourn Avenue; The W. S. Tyler Company, 310 South Michigan Boulevard; Gilbert & Bennett Manufacturing Company, First National Bank Building; American Wire Fabrics Company, 208 South La Salle Street; all of Chicago.

Spring Steel

From C. L. Epps, 229 North Washington Street, Van Wert, Ohio.

Will you please tell me from whom I can obtain three pieces of spring steel 3/32 of an inch thick and ½ inch wide, 30 inches long, also one piece 3/32 of an inch thick and 1 inch wide, 30 inches long?

Ans.—E. T. Ward's Sons Company, 1455 West 37th Street, Chicago.

"Ackerman-Johnson" Expansion Bolts

From Zillman & Kienast, 804 East Main Street, Danville, Illinois.

Kindly advise who makes the Ackerman-Johnson expansion bolts.

Ans.—Ackerman - Johnson Company, 625 West Jackson Boulevard, Chicago.

Junk Brass

From W. C. Smith & Company, Dakota, Illinois.

Can you advise us where we can sell junk brass?

Ans.—Freeport Iron & Metal Company, 101 North Adams Street, Freeport, Illinois; Rockford Iron & Steel Company, 149 Morgan Street, Rockford, Illinois; Chicago Iron & Metal Company, 1322 West Division Street, Chicago, and The Miller Iron & Metal Company, 1522 Noble Street, Chicago.

Lunch Counter Legs and Stools

From The Phoenix Company, Texarkana, U. S. A.

Please tell us where we may buy lunch counter legs and stools.

Ans.—Sani Products Company, 209 West Randolph Street, and The Vitrolite Company, 120 South La Salle Street; both of Chicago.

"Pacific" Boilers

From a Subscriber.

Can you tell us who makes "Pacific" boilers?

Ans.—United States Radiator Corporation, 3254 North Kilbourn Avenue, Chicago.

Domestic, Industrial and Commercial Heating with Gas on Increase

That there has been a startling increase in the number of persons using manufactured gas for heating their homes is revealed by figures published by the American Gas Association.

During 1928 in Illinois there was a 35.5 per cent increase in the use of this fuel for house heating as compared with 1927.

In total use of manufactured gas Illinois registered an 8.5 per cent increase during the year, and the seven states comprising the middle west group—Illinois, Indiana, Iowa, Michigan, Missouri, Minnesota and Wisconsin, increased their use 8.1 per cent over the preceding year.

Industrial and commercial use increased 13.2 per cent for the group and 14 per cent for Illinois.

CHICAGO STADIUM

(*Concluded from page* 24.)

son plant to the structure carries the electric power.

Such is the realization of the 20-year dream of P. T. (Paddy) Harmon, culminating as it has in the design and erection of the largest and most complete indoor sporting arena in the world. The important part which sheet metal has had in the servicing and decorating of this structure has already been outlined and should be a means of stimulating greater effort on the part of sheet metal and air-conditioning men to put themselves and their businesses in a position to be able to do work of this kind. Great credit is due the Sykes Sheet Metal Company and the Carrier Engineering Corporation for the estimable manner in which their part of the work was carried out.

ELBOWS

(*Concluded from page* 14.)

5 gores = 60 degree angle.
6 gores = 75 degree angle.
7 gores = 90 degree angle.

The matter of developing the pattern is identical with Fig. 15, and so further comment is not necessary. In the shop the pattern for gore I is cut out and used as a template for marking the rest. Where an elbow must be made to fit into definite measurements, all gore pieces must be made in length to correspond to the elevation. Hence compare the seam line of elevation with pattern, so that 4-4′ of elevation is the same as 4-a. This is the rivet line, and to this we must add a lap edge and with dividers step off another rivet line equal to the distance of a-b. Then pick the seam line 4-4′ from elevation and set, as b-4′, and draw the horizontal line 4′-4′, after which the miter line c can be stepped off as gore I was.

Or we can cut out the pattern for gore I and lay it on the line 4′-4′, which enables marking miter b, and by reversing also the miter c. The same procedure is duplicated for

Or, if we had a 9 inch pipe and used one 90 degree two piece elbow, we would have:

$$\frac{9 \times 130}{12} = 97.5 \text{ feet of pipe.}$$

Therefore elbows are designed to give a certain radius in the throat. Thus at "B" we show this radius as A-a, to be ½ D, which is one-half of the diameter of pipe, as a-B. But this turn is also very abrupt, for in the table we see it equals a resistance of 30 diameters of pipe length. Then at "C" we have a design whose radius in the throat is 1-D or one diameter of pipe as F-b, being equal to b-E, which gives a resistance of 10 diameters of pipe length. Or at "D," where we use 1½ D as the radius of throat which offers a resistance of 6 diameters of pipe length.

From the table we see the elbow designed so the radius of the throat is equal to two diameters of pipe; the least resistance is met with, which is 4.3 diameters of length. As the radius of throat increases, the frictional resistance also increases slightly. It seems that with the two diameters produced in the flow of materials, the least friction is produced. To shorten or lengthen the curve the flow of materials sets up a greater friction.

Establishing miter lines for the gore pieces of all elbows having more than two pieces gives many tradesmen considerable trouble. The correct theory is to increase the number of gore pieces as the radius of the throat is increased, so as uniform a curve is maintained in the heel of elbow as possible. Thus the aim is to hold the tangent lines of gore pieces close to the arc. For instance, if we made design "C" in only three pieces, the pieces I, III and IV would be lengthened and the pockets formed in the miter joints would form pronounced angles. This would increase frictional resistance and would not make such a good looking elbow. Hence the ratio in pieces per elbow should be governed by the radius of the throat. The following table gives good results:

Gore Pieces in Elbow to Suit Radius of Throat

Radius of throat in diameter of elbow	Gore pieces in elbow
½ to ¾	3
¾ to 1¼	4
1¼ to 1½	5
1½ to 2	7
2 to 3	7
3 to 4	8
4 to 5	9

From this we see an elbow having a 1½ or 2 diameter as the radius for throat we should make 7 gore pieces in the elbow. There are cases where a short radius of possibly ¾ diameter is used and the heel is treated into twice as many gore pieces as the throat. But this is a special treatment when it is desired to maintain the heel as near tangent with the arc as possible. It is a simple matter to do this after fully understanding how the usual gore is arrived at.

Hence we always must have three factors established, or knowing one, we can establish the others. The diameter is always first, since this must correspond with some other pipe work; then the radius of the throat is largely governed by the space in which the turn can be made. Some work requires a short radius turn, while others are unimportant. Most mechanics work to guess

Mrs. J. F. Johnson

To me falls the task—one of the most difficult, in this instance, that there is — that of chronicling the death of the wife of a friend and coworker, Mrs. J. F. Johnson.

Three weeks ago today Mr. Johnson, our advertising copy writer, left the office to begin his vacation in the highest of expectation. During the following week Mrs. Johnson presented him with a fine 8-pound boy. It was, however, necessary to take the child from her by operating and although she seemed at first to have suffered no ill effects, she had a turn for the worse and steadily declined until death relieved her of further suffering on July 1st.

Thus have events in the Johnson family turned, in the brief space of three weeks, from those of the greatest promise to the most tragic, and I am sure that I voice the sentiment of the entire sheet metal and warm air heating industries when I say that our deepest sympathy goes out to the bereaved ones in their time of profound sorrow.

work. Some, if they have all the space in the world, insist on making two piece elbows as at "A" simply because there are only two pieces to join together.

Employers often specify this design because they think it is easier to lay out, does not take so much metal, and is assembled more quickly. This may be true, but they are burdening the public with a lot of inefficient work. The third factor or number of pieces in the elbow is then governed by the radius of throat.

Drawing the Elbow

With these three factors given we draw the diagram for elbow, as say at "B," where the radius of throat is ½ D. Draw the right angle C-A-B, and measure the radius of throat as A-a, and the diameter as a-B, and describe the throat and heel arc. Observe the heel arc B-C will then be 1½ times the diameter. Now notice the end pieces I and III have a miter line on only one end, while the middle piece has a miter line on both ends. Hence, this middle gore piece must be twice as long as the end pieces.

For this reason we allow two spaces for each middle piece and only one space for each end piece. Or another way of doing this is to allow two spaces for each gore piece and then subtract one space for each end. Written in the form of a rule, we have:

3 piece elbow = 3 pieces × 2 spaces = 6 spaces — 2 spaces = 4 spaces.

This means the heel arc is divided into four equal parts. The first and the third part will represent points for drawing the miter lines as shown from the corner A. This enables squaring up the base lines to the miter and then connect the new intersection points with the heel and throat line for the middle piece. This gives the outline of elevation.

Now the same procedure holds good for any number of piece elbow, as at "C" we have a four piece elbow, while at "D" we have a five piece elbow. In either case we proceed identically as before, but first we draw the diagrams as G-F-E and L-K-J as well as the arcs of heel and throat. Then we mentally say:

4 × 2 = 8 — 2 = 6 spaces in heel of "C."

5 × 2 = 10 — 2 = 8 spaces in heel of "D."

This procedure holds true for an elbow or angle no matter what the diameter is, or how many pieces or the angle it must turn to. Some folks prefer to memorize a list of degree lines for each type of elbow. Thus a 3 piece 90 degree elbow has the first miter line on a 22½ degree because 90 ÷ 4 = 22½. Or a 5 5 piece 90 degree elbow has a first miter line of 90 ÷ 8 = 11.25 degrees, etc. But here it is first necessary to follow the calculation of gore III, IV, etc, which establishes horizontal center line 4″-4″, etc.

Short Methods

Many workmen have reduced some of the work of laying out elbows and call it "My" method.

With elbows, the geometry can be shortened, but when you shorten it above Fig. 16 you let out certain measurements that must be guessed at. Of course, in the end you make an elbow, but you do not know if it is made precisely to measurements for sweep, length, and position. Others take a straight piece of pipe, stick it in a pail of water to the bevel or angle the pipe is to incline. Then the water level will mark the cutting line for the miter cut, and if you do not hold the pipe absolutely square to the angle, you still make something that you can call an elbow angle. Often it takes twice as much work to force poorly fitting pieces into line and still do a botch job.

Take in Fig. 17, all that is absolutely necessary is the "rise of miter" M-N-O, which is the angle Q. This can be set down for a 3-piece or 4-piece or a 20-piece elbow. Then by describing the section R, the rest of the miter cut can be developed, as the patterns in Figs. 15 and 16.

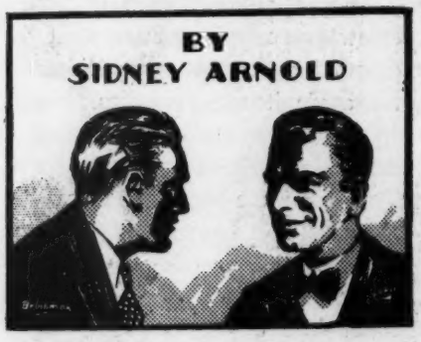
Still other men when space does not permit projecting lines, or lines are too numerous for picking, use the method shown in drawing "S." Here we place the circumference on the line 4-4′ and square out stretchout lines. Next bisect the rise of miter N-O as in point P, no matter what it works out to be just so it is the bisection of the rise. Take this O-P as radius and using points 4 and 4′ in pattern "S" as centers; strike the semi-circles P′ and P″. Divide these in half as many equal spaces as the full girth requires. Then join the points in P′ and P″ with horizontal lines, thus cutting the stretchout lines for tracing the miter cut as shown.

This method is very good on large work and can be used in connection with Figs. 15 and 16 if desired. But the one thing we develop here is the miter cut, which is perfectly accurate. However, the length of the gore at the side as x or the distance in the throat as Y is not known, unless we use a diagram as in Figs. 15 or 16. If we must guess at the length of the gore X, then we again make an elbow or angle, but we do not know the precise radius it will possess nor the length it will have, and so we can not work to measurements

Men who must work accurately to job measurements or plans can not risk slipshod geometry for their correct fits. In fact, the man who does laying out has a greater freedom of time and does not have to work like a cyclone. Tradesmen who think they can gain time by following a few short methods often create the condition of adding a few extra hours on a job before it is done. It is expected for a person who does not do so much laying out, as only a job now and then that it takes longer than for a man who lays out most of the time.

In fact, it is much more profitable for a layerout to fold his arms and think the job over for an hour and plan out the best construction—that is engineering. After the plans have been made and perfected, then the men are put through the harness with profit. But to force a layerout, a designer, an engineer, in crowding the natural functions of his brain, it too often results in large waste and inefficiency. Hence short meth-

RANDOM NOTES AND SKETCHES



We had the pleasure of a visit on Monday of this week from Mr. and Mrs. William Gunton of the Success Heater Manufacturing Company, Des Moines, Iowa. Mr. and Mrs. Gunton were in the city on a combined pleasure and business trip, and took time enough out to drop in for a few moments. Our new location makes it much more convenient for folks to stop in between trains, and we are glad to have them do it.

* * *

We also had a visit on Tuesday of this week from J. Skulte, sales manager of the Alamo Heater Company, Chicago. Mr. Skulte is very much interested in warm air heating, and takes every opportunity he can to learn more about it.

* * *

Get It Straight

A gang of cattle rustlers and hog thieves had been operating in the neighborhood for some time. Finally one of the band was apprehended and brought into court. The jury was composed of farmers and cattlemen and they brought in a speedy verdict of "Guilty." It was up to the judge to pronounce sentence. Glaring at the prisoner, he said:

"There's been too much of this pig stealing going on lately and I'm going to make an example of you, or none of us will be safe."

* * *

The jawbone of an ass is just as dangerous a weapon today as it was in Samson's time, remarked one editor. I'd say much worse when you consider the radio and some of its uses.

* * *

We had a very nice visit with M. E. Ticen on Friday of last week. Mr. Ticen was formerly with the XXth Century Heating & Manufacturing Company but is now manager of the new Dis-O-Stove department of the Williams Oil-O-Matic Company. It was indeed very nice of Mr. Ticen to come in and see us.

* * *

A Slight Error

Miss Irene Fengles, Baltimore, newly elected treasurer of the National Ladies' Auxiliary, waited on the corner joyously, then pensively, then expectantly, then casually, then anxiously, and two hours passed.

"Man," she said, "is a perfidious animal, faithless and untrue, incapable of consummating a promise."

Two hundred yards down the street a gentleman waited who said the same thing about women—she was on the wrong corner.

* * *

Mrs. Paul Biersach: "I see by this paper that in certain parts of India a wife can be bought for two dollars. Isn't that perfectly awful?"

Paul (himself): "Well, I don't know. A good wife is worth that."

* * *

Entirely New Disease

"Say, Bozo, I heard you were sick last week."

"Yes, I was. I had the new disease called 'clothing sickness'."

"What on earth is that?"

"Well, I had a coat on my tongue and my breath came in short pants."

Attention Ladies

Miss Mary O'Leary, Louisville: "I wish to announce that on Wednesday evening the Ladies' Aid will have a rummage sale. This is a chance for all the ladies of the congregation to get rid of anything that is not worth keeping, but is too good to be thrown away. Don't forget to bring your husbands."

* * *

"Do you know how to make a peach cordial?"

"Sure; send her some candy."

* * *

Clara: "Do you get your alimony regularly?"

Marie: "No, I might just as well be living with him."

* * *

Scentsitive

Mrs. Paul Jordan, Indianapolis: "I was highly incensed by the actions of that bold girl you were dancing with last evening."

Paul Jordan: "Well, I was highly perfumed myself."

* * *

"Now," said the Sunday school teacher, "why is a certain part of the church called the altar?"

"Because," said the bright boy, "it's the place where women change their names."

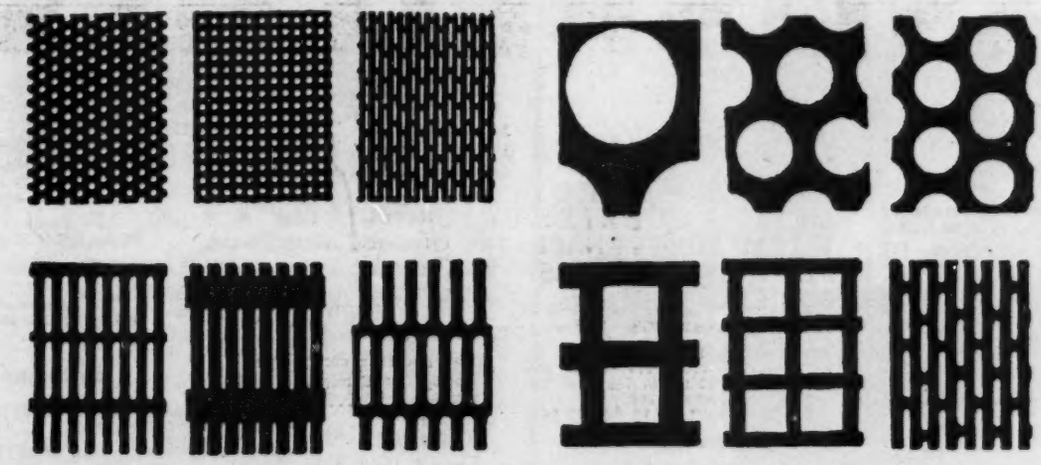
* * *

Long on Fox Knowledge

Mrs. Geo. I. Ray, wife of first vice-president, National Sheet Metal Contractors Association, was in Alaska looking over a fox farm. After admiring a beautiful silver specimen she asked her guide: "Just how many times can the fox be skinned for his fur?"

"Three times, madam," said the guide gravely. "Any more than that would spoil his temper."

PERFORATED METALS



All Sizes and Shapes of Holes in all Kinds and Thicknesses of Metal.

Punched Metal Grilles, Register Faces, Ventilators, etc.

Guard Material for Machines and Belts. We supply a complete line of Accessories

Screens for Grain, Minerals or anything to be screened.

Perforated Tin and Brass always in stock

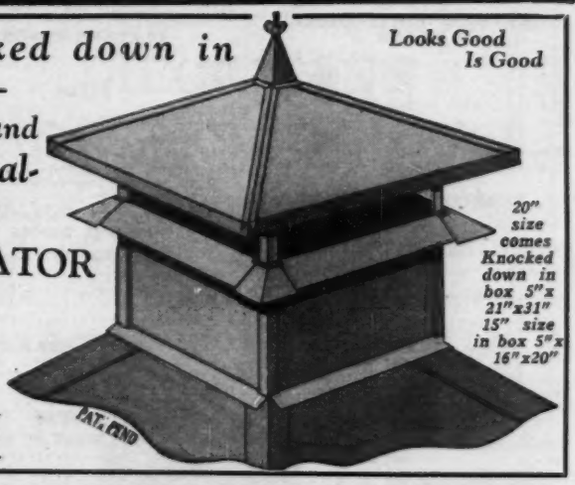
THE HARRINGTON & KING PERFORATING CO.

5649 FILLMORE STREET, CHICAGO, ILLINOIS, U. S. A.

New York Office: 114 Liberty Street

comes knocked down in handy carton—can be assembled and made ready for installing in 12 minutes

Looks Good Is Good



20" size comes Knocked down in box 5"x 21"x31" 15" size in box 5"x 16"x20"

The FOLSON SUPER "K. D." VENTILATOR

NOW you can STOCK a high grade ventilator conveniently. Shipping knocked down in cartons means low shipping costs—and easy stocking.

Easily installed on any roof—made of 26 and 24 gauge galvanized steel—low in price but highly efficient.

Rain proof—storm proof and it ventilates with wind in any direction.

Let us tell you all about it—Write for illustrated circular and prices today.

FOLSON METAL PRODUCTS COMPANY

5111 WEST NORTH AVENUE . . . . . CHICAGO, ILL.

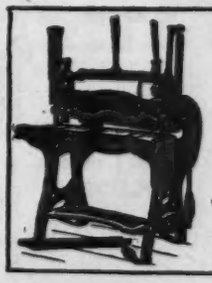
RYERSON SHEETS

IMMEDIATE SHIPMENT FROM STOCK

More than twenty kinds of Prime quality sheets are carried in stock. There is a special sheet for every purpose. Also Bars, Angles, Rivets, Bolts, Tools and Metal-Working Machinery. *Write for Journal and Stock List.*

JOSEPH T. RYERSON & SON INC.

Chicago Milwaukee Jersey City Boston Detroit St. Louis Cincinnati Cleveland Buffalo



TREADLE SHEAR

This TREADLE GAP SHEAR is made in all standard sizes for No. 14 and lighter gauge sheets. With it, sheets can be squared, trimmed or slit.

We make a complete line of shears, punches and bending rolls, all sizes for hand or belt drive. Write for Catalog "S."

BERTSCH & COMPANY Cambridge City, Ind.

Read the Wants and Sales Pages

Send for catalog today

VIKING SHEAR

Compound LEVER Handle—Removable Blades

A child can work them

VIKING SHEAR CO., Erie, Pa.

Say you saw it in AMERICAN ARTISAN—Thank you!

Chicago Warehouse Metal and Furnace Supply Prices

AMERICAN ARTISAN is the only publication containing Western Metal, Furnace Supply and Hardware prices corrected weekly

METALS

PIG IRON

Chicago Fdy., No. 2	$20 00
Southern Fdy. No. 2	21 51
Lake Superior Charcoal	27 04
Malleable	20 00

FIRST QUALITY BRIGHT CHARCOAL TIN PLATES

IC	20x28 112 sheets	$22 50
IX	20x28	25 50
IXX	20x28 56 sheets	14 50
IXXX	20x28	15 50
IXXXX	20x28	17 00

TERNE PLATES

		Per Box
IC	20x28, 40-lb. 112 sheets	$26 70
IX	20x28, 40-lb. 112 sheets	29 70
IC	20x28, 25-lb. 112 sheets	22 20
IX	20x28, 25-lb. 112 sheets	25 20
IC	20x28, 20-lb. 112 sheets	20 25
IV	20x28, 20-lb. 112 sheets	23 00

"ARMCO" INGOT IRON PLATES

No. 8 ga.—100 lbs.	$4 15
3/16 in.—100 lbs.	4 05
¼ in.—100 lbs.	3 85

COKE PLATES

Cokes, 80 lbs., base, 20x28	$12 00
Cokes, 90 lbs., base, 20x28	12 20
Cokes, 100 lbs., base, 20x28	12 40
Cokes, 107 lbs., base, IC 20x28	12 75
Cokes, 135 lbs., base, IX 20x28	14 75
Cokes, 155 lbs., base, 2X, 56 sheets	8 50
Cokes, 175 lbs., base 3X, 56 sheets	9 35
Cokes, 195 lbs., base 4X, 56 sheets	10 25

BLUE ANNEALED SHEETS

Base 10 ga. per 100 lbs.	$3 35
"Armco" 10 ga. per 100 lbs.	4 15

ONE PASS COLD ROLLED BLACK

No. 18-20 per 100 lbs.	$3 85
No. 22 per 100 lbs.	4 00
No. 24 per 100 lbs.	4 05
No. 26 per 100 lbs.	4 15
No. 27 per 100 lbs.	4 20
No. 28 per 100 lbs.	4 30
No. 29 per 100 lbs.	4 45
No. 30 per 100 lbs.	4 55

"ARMCO" GALVANIZED

"Armco" 24 per 100 lbs.	$6 15

GALVANIZED

No. 16 per 100 lbs.	$4 40
No. 18 per 100 lbs.	4 55
No. 20 per 100 lbs.	4 70
No. 22 per 100 lbs.	4 75
No. 24 per 100 lbs.	4 90
No. 26 per 100 lbs.	5 15
No. 27 per 100 lbs.	5 25
No. 28 per 100 lbs.	5 40
No. 30 per 100 lbs.	5 80

BAR SOLDER

Warranted 50-50 per 100 lbs.	$31 25
48-52 per 100 lbs.	30 50
45-55 per 100 lbs.	29 25
Plumbers' per 100 lbs.	27 25

ZINC

In Slabs	$ 7 35

SHEET ZINC

Cask Lots (600 lbs.)	$11 75
Sheet Lots	13 75

BRASS

Sheets, Chicago base	24¼c
Mill base	23¼c
Tubing, brazed, Chicago base	31⅞c
Mill base	30⅞c
Tubing, seamless, Chicago base	29¼c
Mill base	28¼c
Wire, Chicago base	24⅝c
Mill base	23⅝c
Rods, Chicago base	22¼c
Mill base	21¼c

COPPER

Sheets, Chicago base	27⅝c
Mill base	26⅝c
Tubing, seamless, Chicago base	30¼c
Mill base	29¼c
Wire, plain rd., 8 B. & S. Ga. and heavier	25⅝c

LEAD

American Pig	$7 85
Bar	8 85

TIN

Bar Tin per 100 lbs.	$50 00
Pig Tin per 100 lbs.	49 00

HARDWARE, SHEET METAL SUPPLIES, WARM AIR FURNACE FITTINGS AND ACCESSORIES.

ASBESTOS

Paper up to 1/16	6c per lb.
Roll board	7½c per lb.
Mill board 3/32 to ⅛,	7½c per lb.
Corrugated Paper (250 sq. ft. to roll)	$6 00 per roll

BRUSHES

Furnace Pipe Cleaning Bristle with handle each	$0 75
Flue Cleaning Steel only, each	1 25

CEMENT, FURNACE

American Seal, 5-lb. cans, net	$ 45
American Seal, 10-lb. cans, net	85
American Seal, 25-lb. cans, net	2 25
Pecora per 100 lbs.	7 50

CHIMNEY TOPS

Adams' Revolving	Wt. Doz.	Price Doz.
4 in.	21 lbs.	$11 00
6 in.	24 lbs.	11 50
7 in.	30 lbs.	13 50
8 in.	33 lbs.	15 00
9 in.	51 lbs.	16 50
10 in.	56 lbs.	18 00
12 in.	66 lbs.	22 00
14 in.	110 lbs.	36 00

CLINKER TONGS

Each	$1 50

CLIPS

Damper No-Rivet Steel, with tail pieces, per gross	$9 50
Rivet Steel, with tail pieces, per gross	7 50
Tail pieces, per gross	2 40

COPPERS—Soldering Pointed Roofing

3 lb. and heavier	per lb. 40c
2½ lb.	per lb. 45c
2 lb.	per lb. 48c
1½ lb.	per lb. 55c
1 lb.	per lb. 60c

CORNICE BRAKES

Chicago Steel Bending Nos. 1 to 6B	Net

CUT-OFFS

Gal., plain, round or cor. rd.

26 gauge	30%
28 gauge	35%

DAMPERS

Yankee Hot Air	
7 Inch, doz.	$1 60
8 inch, doz.	2 20
9 inch, doz.	2 60
10 inch, doz.	2 80
12 inch, doz.	3 50
14 inch, doz.	5 00

ADAMS No. 1 CHECK

Check and Collar Complete	
8 inch, each	2 00
9 inch, each	2 25
End Check Only	
8 inch, each	1 60
9 inch, each	1 85
Collar Only	
8 inch, each	50
9 inch, each	65

No. 2 CHECK

8 inch, each	1 00
9 inch, each	1 00

10% Disc. on Adams No. 1 and No. 2 Check

Diamond Smoke Pipe	
7 inch, doz.	$2 00
8 inch, doz.	3 20
9 inch, doz.	4 80
10 inch, doz.	6 00

Adams' Sheet Metal

7 inch, doz.	$1 60
8 inch, doz.	2 20
9 inch, doz.	2 60
10 inch, doz.	2 80
12 inch, doz.	3 50
14 inch, doz.	5 00

EAVES TROUGH

Galv. Crimpedge, crated	75-10%
Zinc, "Barnes"	60%

ELBOWS

Conductor Pipe

Galv. plain or corrugated, round flat Crimp,

28 Gauge	60%
26 Gauge	45%
24 Gauge	15%

Galv. Terne Steel

Plain Rd. and Rd. Corr.:

28 Ga.	60%
26 Ga.	45%
24 Ga.	15%

Square Corrugated

No. 28 Gauge	50%
26 Gauge	35%

Portico Elbows

Standard Gauge Conductor Pipe, plain or corrugated.

Not nested	70 & 5%
Nested Solid	70 & 5%

Sq. Corr., A. & B. & Octagon

28 Ga.	50%
26 Ga.	35%

Portico

1", 1¼", 1½"	45%

Copper

16 oz., all designs	40%

Zinc—

All styles	60%

ELBOWS—Stove Pipe

1-piece Corrugated. Uniform Blue "Milcor" No. 28 Gauge.	Doz.
5-inch	$1 15
6-inch	1 25
7-inch	1 75

Special Corrugated

6-inch	$1 00
7-inch	1 60

Adjustable—Uniform Blue

"Milcor" No. 28 Gauge. Uniform Blue.

5-inch	$1 60
6-inch	1 75
7-inch	2 10

WOOD FACES—60% off list.

FENCE

726-6-12½%	(100 rods) $28 68
1948-6-14½%	(100 rods) 43 62

FILES AND RASPS

Heller's (American)	50-10%
American	60-10%
Arcade	50%
Black Diamond	50%
Eagle	50%
Great Western	50%
Kearney & Foot	50%
McClellan	50%
Nicholson	50%
Simonds	40%

FIRE POTS

Geo. W. Diener Mfg. Co.	Ea.
No. 02 Gasoline Torch, 1 qt.	$ 5 15
No. 9250, Kerosene, or Gasoline Torch, 1 qt.	6 50
No. 10 Tinner's Furn. Square tank, 1 gal.	11 25
No. 15 Tinner's Furn. Round tank, 1 gal.	10 75
No. 21 Gas Soldering Furnace	8 00
No. 110 Automatic Gas Soldering Furnace	10 50

GALVANIZED WARE

Pails (Galv. after made), 10-qt.	$2 00
Tubs (Galv. after made). No. 1	5 75
No. 2	6 50

GLASS

Single Strength, A, all brackets	85%
Single Strength, B, all brackets	87%
Double Strength, A, all brackets	85%
Double Strength, B, all brackets	87%

HANGERS

Conductor Pipe	
Milcor Perfection Wire	35%
Milcor Triplex Wire	10%
Eaves Trough	
Milcor Steel (galv. after forming) from List	50%
Milcor Selflock B. T. Wire, List	10%

HOOKS

Conductor	
"Direct Drive" Wrought Iron for wood or brick	15%

HUMIDIFIER

"Front-Rank," Automatic	
In single lots	50%
In lots of 10 or more	50-5%
In lots of 25 or more	50-10%
Vapor pans, etc., each	50%

LIFTERS

Stove Cover	
Coppered per gro.	$6 00
Alaska per gro.	4 75

MALLETS

Tinners	
Hickory per doz.	$2 25

MITRES

Galvanized steel mitres	
28 Ga.	70
26 Ga.	60-20

NAILS

Cut Steel, base	$4 00
Wire	
Common	$3 10
Cement Coated	3 14

(Continued on page 32)

ORNAMENTS
ZINC-COPPER-BRONZE

WRITE FOR CATALOG AND MARQUEE FOLDER

MILLER & DOING, INC.
66 YORK STREET BROOKLYN, N. Y.

EARLE'S VENTILATOR

IMPROVED REVOLVING

It runs in a self-lubricating bearing that is not affected by heat or cold. It is noiseless and produces an upward current of air. No down draft. It will satisfy and give you a good profit.

ASK YOUR NEAREST JOBBER

BERGER BROS. CO.
229 to 237 ARCH STREET
WAREROOMS AND FACTORY: 100 TO 114 BREAD STREET
PHILADELPHIA, PA.
Manufacturers of "Quaker City" line of Miters, Ends, Caps and Outlets 2

The NEW IMPROVED **"STANDARD"**
TRADE MARK REG.

Rotable Ventilator
Now made of Armco Iron

This favorite cone-shaped ventilator is now improved in several important points.

The weight of the ventilator body is now carried on a concave thrust bearing nested in the apex of the conical body. This bearing turns upon the pivot point of the stationary center spindle.

The bronze Guide Bushings are now made of non-corrosive bronze which minimizes friction and any tendency to screech when body is rotating.

There are other new features. Write today for new catalog and price list.

STANDARD VENTILATOR CO., Lewisburg, Pa.

The 12-Cylinder Ventilator Used in Every State in the Union.

SPECIFY ÆOLUS VENTILATORS

ÆOLUS FOR HOMES

The home should be properly ventilated—few of them are. Here is a sales opportunity often overlooked by the average Sheet Metal Worker, but one which offers a lucrative business to those who take advantage of it.

Æolus-Dickinson
Vent Makers Since 1888
3332-52 South Artesian Avenue
CHICAGO
Phone: Lafayette 1862-1863

Round Corrugated

Plain Round

NEVER MADE WITHOUT THIS
TRADE *F. Dieckmann* MARK

Quality and Service Made 'em Famous

Made of one piece of heavy gauge material, in all styles and angles from 10 to 90 degrees, of 24, 26, 28 ga. ternes, then galvanized after formation.

DIECKMANN
Elbows and Shoes

are the standard of the market and always give satisfaction

Send for new catalogue 26 showing complete line

The Ferdinand Dieckmann Co.
P. O. Station B, Cincinnati, O.

Square Corrugated Style A

Square Corrugated Style B

Not made lighter than 28 ga. or 16 oz. copper

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PASTE

Asbestos Dry Paste:

200-lb. barrel	$14 00
100-lb. barrel	7 50
50-lb. pail	4 25
10-lb. bag	1 00
5-lb. bag	55
2½-lb. cartons	25

POKERS, FURNACE

Each $0 75

POKERS, STOVE

Nickel Plated, coil handles, per doz. 1 10
W'r't Steel, str't or bent, per doz. $0 75

PIPE

Conductor
Cor. Rd., Plain Rd., or Sq.

Galvanized
Crated and nested (all gauges) 75-7½%
Crated and not nested (all gauges) 75-2½%

Furnace Pipe
Double Wall Pipe and Fittings .....50 & 10%
Single Wall Pipe, Round Galvanized Pipe ....50 & 10%
Galvanized and Tin Fittings .....50 & 10%

Lead
Per 100 lbs. $12 50

Stove Pipe
"Milcor" "Titelock" Uniform Blue Stove

28 gauge, 5 inch U. C. nested	11 00
28 gauge, 6 inch U. C. nested	12 00
28 gauge, 7 inch U. C. nested	14 00
30 gauge, 5 inch U. C. nested	10 25
30 gauge, 6 inch U. C. nested	11 00
30 gauge, 7 inch U. C. nested	13 00

T-Joint Made up
6-inch, 28 ga....per doz. $ 3 40
All Zinc
No. 11, all styles 60%

PULLEYS

Furnace Tackle....per doz. $0 85
.....per gro. 8 50
Furnace Screw (enameled) .....per doz. 75

PUTTY

Commercial Putty, 100-lb. Kits $3 50

QUADRANTS

Malleable Iron Damper.....10%

REDUCERS—Oval Stove Pipe

	Per Doz.
7—6, 28-gauge, 1 doz. in carton	$2 00

REGISTERS AND BORDERS

Baseboard, Floor and Wall

Cast Iron 20%
Steel and Semi-Steel 33⅓%
Baseboard, 1 piece 33⅓-20%
Baseboard, 2 piece 33⅓%
Wall 33⅓%
Adjustable Ceiling Ventilators 33⅓%

Register Faces—Cast and Steel

Japanned, Bronzed and Plated, 4x6 to 14x14.....33⅓%
Large Register Faces—Cast, 14x14 to 38x42 .....50%
Large Register Faces—Steel, 14x14 to 38x42 .....60%

Ventilating Register

Per gross	9 00
Small, per pair	30
Large, per pair	50

RIDGE ROLL

Galv., Plain Ridge Roll, b'did 75-15-5%
Galv., Plain Ridge Roll crated 75-15

SCREWS

Sheet Metal

7, ½x⅛, per gross $0 53
No. 10, ¾x3/16, per gross 68
No. 14, ¾x¼, per gross.. 83

SHEARS, TINNERS' & MACHINISTS'

Viking $23 00

Lennox-Throatless
No. 18 .....35%
Shear blades 10%
(f. o. b. Marshalltown, Iowa)

SHIELDS, ADJUSTABLE RADIATOR

No. 1 "Gem" 11" to 17"....30%
No. 2 "Gem" 14" to 24"....30%
No. 3 "Gem" 35" to 65"....30%

SHOES

Galv. 28 Gauge, Plain or corrugated round flat crimp..60%
26 gauge round flat crimp..45%
24 gauge round flat crimp..15%

SNIPS, TINNERS

Clover Leaf .....40 & 10%
National .....40 & 10%
Star 50%
Milcor .....Net

SQUARES

Steel and Iron .....Net
(Add for bluing $3 per doz. net)
Mitre .....Net
Try .....Net
Try and Bevel .....Net
Try and Mitre .....Net
Fox's .....per doz. $6 00
Winterbottom's 10%

STOPPERS, FLUE

Common .....per doz. $1 10
Gem, No. 1 .....per doz. 1 10
Gem, flat, No. 3....per doz. 1 60

VENTILATORS

Standard .....30 to 40%

WIRE

Black annealed wire, No. 9, per 100 lbs. $3 30
Galvanized barb wire, per 100 lbs. 3 90
Cattle Wire—galvanized catch weight spool, per 100 lbs.. 3 80
Galvanized Plain Wire, No. 9, per 100 lbs. 3 25

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Cornice Brakes
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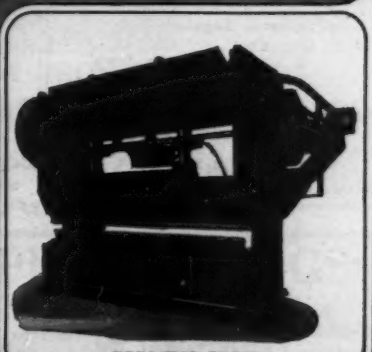

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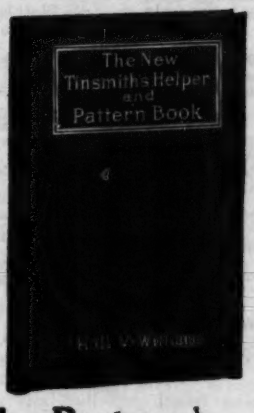

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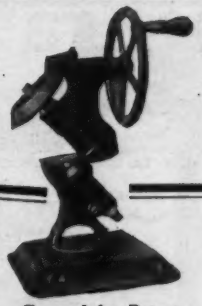

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PRESSURE GAUGES
SPLITTING SHEARS
BEVEL SHEARS
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Asbestos Dry Paste:

200-lb. barrel	$14 00
100-lb. barrel	7 50
50-lb. pail	4 25
10-lb. bag	1 00
5-lb. bag	55
2½-lb. cartons	25

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Each $0 75

POKERS, STOVE

Nickel Plated, coil handles, per doz. 1 10
W'r't Steel, str't or bent, per doz. $0 75

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"Milcor" "Titelock" Uniform Blue Stove

28 gauge, 5 inch U. C. nested	11 00
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30 gauge, 7 inch U. C. nested	13 00

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..... per gro. 8 50
Furnace Screw (enameled) ..... per doz. 75

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	Per Doz.
7—6, 28-gauge, 1 doz. in carton	$2 00

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Steel and Semi-Steel 33⅓%
Baseboard, 1 piece 33⅓-20%
Baseboard, 2 piece 33⅓%
Wall 33⅓%
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Register Faces—Cast and Steel

Japanned, Bronzed and Plated, 4x6 to 14x14 ..... 33⅓%
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Large Register Faces—Steel, 14x14 to 38x42 ..... 60%

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Large, per pair	50

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Galv., Plain Ridge Roll, b'did 75-15-5%
Galv., Plain Ridge Roll crated 75-15

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No. 10, ¾x3/16, per gross 68
No. 14, ⅜x¼, per gross.. 88

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Shear blades 10%
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Gem, flat, No. 3 .... per doz. 1 00

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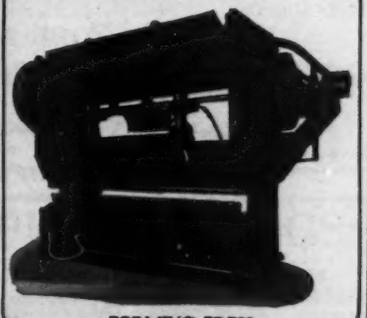

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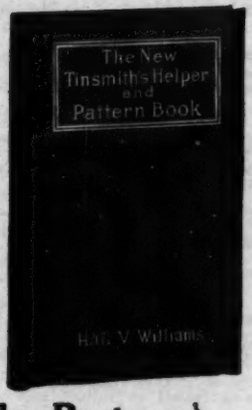

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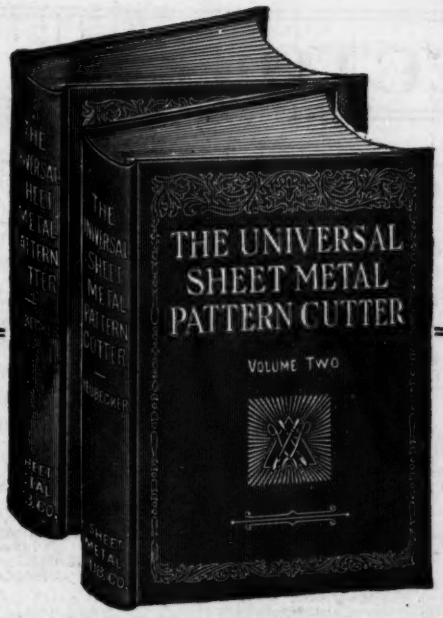

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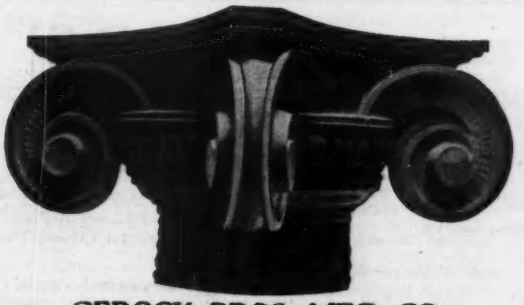

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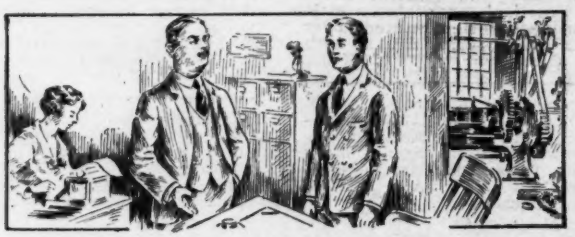

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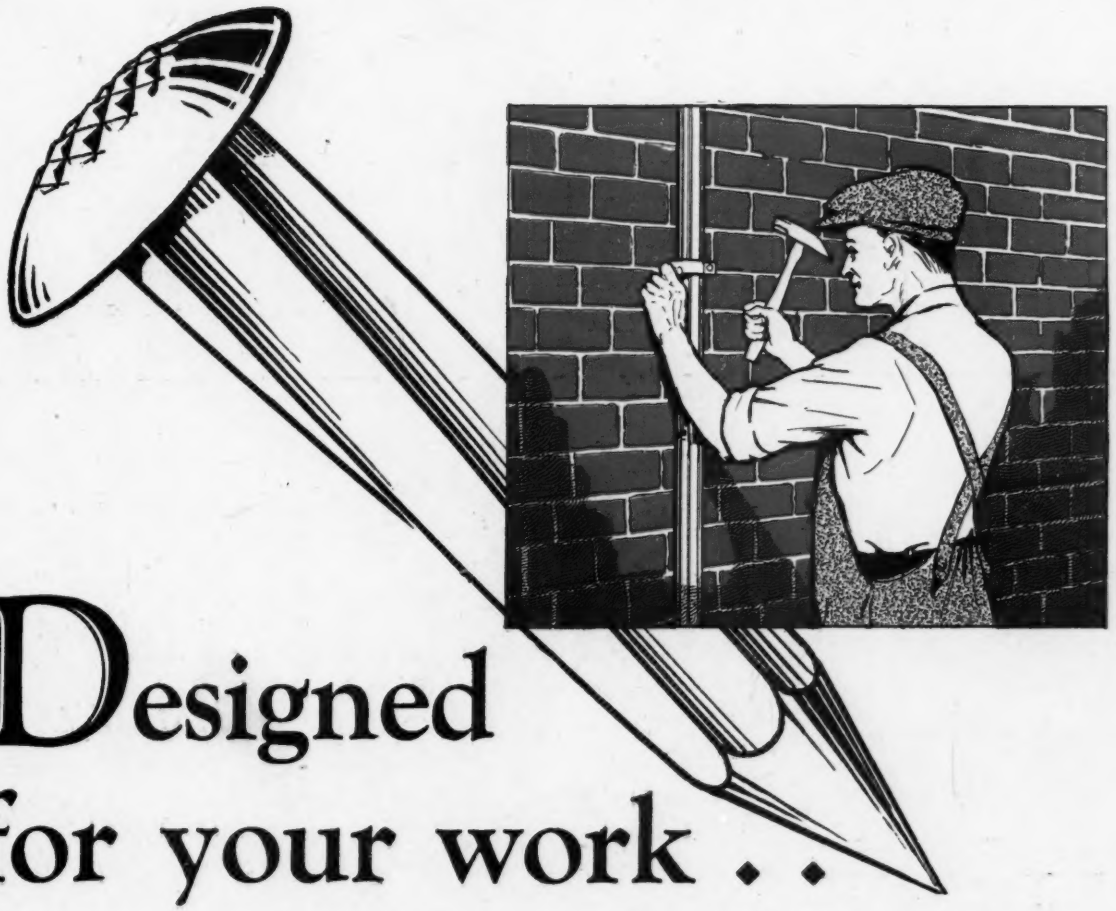

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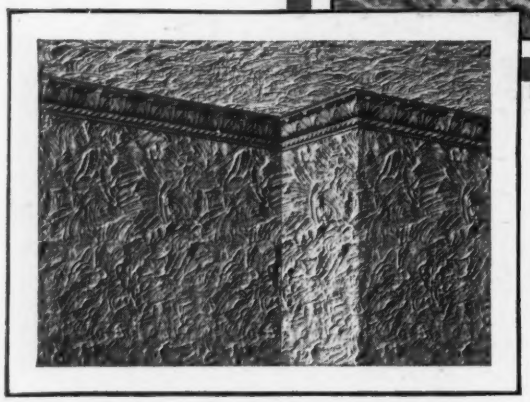

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SPANISH Texture... the new Eller metal ceiling... opens an entirely new field of opportunity. Because of the beauty of its unusual design, it can be used in many places where metal ceilings and walls were heretofore inappropriate.

Spanish Texture properly decorated over an old ivory base, so closely resembles rough texture plastering, that it can be distinguished only upon close examination. In no other way can such an attractive... firesafe... sanitary... and lasting interior finish be achieved at such low cost.

Recommend Eller's Spanish Texture wherever an outstanding interior finish is demanded. It is simple to apply... labor saving and time saving. Complete costs and description will be sent upon request.

ANACONDA from mine to consumer

Ingot Iron

THE ELLER MANUFACTURING CO.

CANTON, OHIO